Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT.

Vol. 74—No. 24. CHICAGO, SATURDAY, JUNE 14, 1919. Page 977.

Harbor Board's Industrial Electric Tractor Hauling Train of Mixed Freight on San Francisco Water Front.

Use of Electrical Equipment on San Francisco Water Front

The Congested Condition of Piers Necessitates the Adoption of Industrial Electric Trucks, Tractors, Conveyors and Piling Machines—Description of Installations—Methods of Operating

By CHARLES W. GEIGER

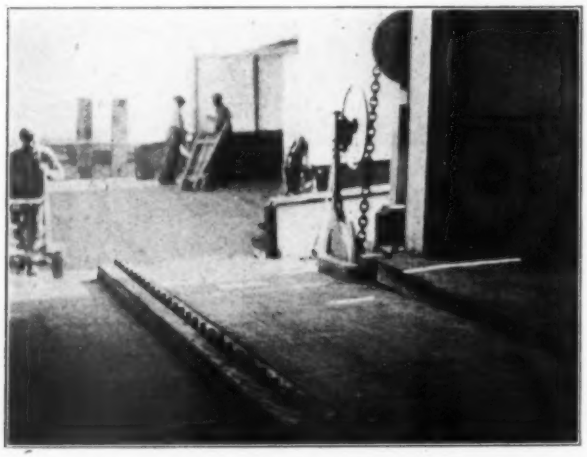
ELECTRICALLY operated machinery is beginning to play a vital part in dispatching and handling the vast traffic at the port of San Francisco. This is shown by the recent extensive installations of electrically operated freight-handling equipment. The apparatus is of two types and is designed for two purposes. One type consists of tractors and trailers and the other type consists of portable conveyors and piling machines.

The construction of new piers has been prosecuted by the Harbor Board with all the energy at its command until at the present time there are 49 active piers, with a cargo area of 5,712,080 sq. ft. or about 131 acres. There is a total berthing space of 15 miles, capable of accommodating at one time 245 vessels of average size. Even with all this space every square foot of wharfage is now occupied and the demand for additional space by various steamship concerns is so insistent that the Harbor Board has not only taken steps to hasten the completion of all work now under way and to start on new work, but, together with the various occupants, has adopted every possible means to increase the efficiency and capacity of the present piers.

In order to bring about this increase in the capacity the Harbor Board recently purchased two electric portable conveyors and two electric portable tiering machines as an experiment and probably will equip each of its wharves with one or more of these machines. By using this equipment freight may be piled to a height of 16 or 20 ft. as against about 5 ft. by hand, thus easily doubling the pier capacity. The wiring of all piers that is not already arranged for the operation of these machines is now being rushed to completion by the electrical department under the direction of Mr. Stanton, chief of the electrical department of the Harbor Board.

The conveying machines are of the Brown portable

type, with carriers 22 ft. in length, 32½ in. in width, built of 1¼ by 2¼-in. maple. These carriers are raised and lowered by a 3-hp., 220-volt, 3-phase, 60-cycle motor and are mounted on ball-bearing casters with roller-bearing wheels. Each machine is provided with 100 ft. of armored-cable conductor, with a suitable plug and receptacle attached. These conveyors will be used in handling boxes, bags, etc., up to 300 lb., which are to be stacked to a height



Electrically Operated Conveyor Used to Assist Hand Trucks Up Incline.

of 10 to 12 ft. They will also be used for other purposes such as loading material into vessels and cars. The portability of the apparatus gives it wide usefulness as it can be easily and quickly moved about to wherever the job is.

The tiering machines are of the Standard type, with a capacity of 1500 lb. These have a heighth of 16 ft. with a lift of 13 ft. The overall dimensions of the base are 49 by 60 in. and the platform, which is 30 by 40 in., is raised at a speed of 30 ft. per min. They are also operated by 3-phase, 220-volt, 60-cycle motors and are provided with armored cable conductors for attaching to the power circuits.

These tiering machines will be used in piling boxes and bales weighing over 300 lb. and up to 1500 lb. such as baled cotton and hemp. Practically every vessel plying between the Philippines and San Francisco carries a consignment of baled hemp as part of its cargo. Previous to the installation of the tiering machines, the piers were badly congested when a large cargo of hemp was unloaded, but with these tiering machines the cargo space for hemp will be trebled as the heavy bales can now be piled in three or more tiers.

In addition to the portable conveyors installed by the Harbor Board, various steamship companies having assignments of wharves have installed or are installing conveyors of this type. At the present time the Pacific Mail Steamship Co. probably has the most extensive equipment of this type of any concern along the water-front. One of the piers occupied by this company is a double-decker and it has been found that this equipment is especially adapted for this pier.

Industrial Trucks and Tractors Important Part of Equipment.

The type of freight-handling equipment that is being universally adopted along the San Francisco water front is the electric lift truck and the industrial electric tractor and trailer. San Francisco shipping men were not long in adopting this apparatus. Beginning with a single machine in many cases, its value was soon realized and additional equipment added as rapidly as possible. The results in actual practice have been so much greater than was anticipated that the users promptly became effective exponents of such means of transportation and their enthusiasm has been rapidly transmitted to others in need of such transportation service. Freight of all descriptions, it was found, could be handled more rapidly with less cost and with greater accuracy by this method, and today these machines form one of the most important parts of the equipment of the leading steamship companies.

The electric lift truck is adaptable to almost every condition where materials of any kind are to be moved in and around the pier. The principle involved in the use of the lift truck is the placing of materials on comparatively cheap platforms of wood or metal. These platforms are picked up by the lift truck and left at their destinations. The problem of adapting an electric lift truck to the pier conditions is simply the problem of designing platforms best adapted for holding the materials being worked upon. Their installation not only means a marked increase in capacity and a most profitable saving in men and money, but in most cases provides entire relief from that congestion which slows down loading and unloading steamers.

The steamship companies are realizing that these electrically operated lift trucks are necessary not only on account of their cost reducing characteristics and general convenience, but on account of their drawing less on the employe's brawn, thus keeping him better satisfied. The harmony thus created between man and machine strengthens the production flow and lightens labor. The average stevedore on the San Francisco water-front is taught to operate these electric tractors and trucks in a very few hours.

The operation of the machines is greatly facilitated through the excellent condition of the pavement of the various piers and wharves. The driveways are practically all paved with wood-blocks or asphalt, and the cargo areas are usually paved with bituminous concrete.

The Oceanic Steamship Co. was one of the most recent concerns to install a fleet of lift trucks. It is now operating a fleet of 9 Elwell-Parker lift trucks, which have been found to be especially adapted to the economical and efficient handling of its particular class of cargo. The company occupies piers 35 and 37. In addition to operating a fleet of steamships to Australia, the company acts as agent for the Java steamship line, which operates a fleet of steamers to the Dutch East Indies.

Probably the most difficult class of cargo handled at the Oceanic piers is crude rubber which is shipped in 200-lb. cases. These cases are now carried from shipside to pier and from pier to freight cars by the electric trucks. By the old method of hand trucks, 8 men required 3 hours to load a 40-ton car, but with the electric truck, 5 men now do the same work in 2 hours. In loading the rubber, eight cases are piled on a platform. The electric lift-truck is then driven beneath the platform and the load is lifted onto the truck ready for transportation; after delivery it is unloaded in a similar manner.

Each of the piers is equipped with two tracks, one being depressed, bringing the floor of the freight car on a level with the pier, while the other track is level with the pier. A 20-ft. plank incline 6 ft. wide is used for loading from the pier to freight cars on the tracks that are not depressed.

This method is also employed in handling tea, of which immense shipments pass through these piers.

Some steamers carry from 25,000 to 40,000 100-lb. cases of tea. Other shipments handled in this manner are tapioca, 220 lb. to the bag, copra in bags, Kapoc in bales of 100, 200 and 300 lb., baled hemp, spices, etc. As a result of the excellent service rendered by the fleet of Elwell-Parker trucks at piers 35 and 37, this company recently purchased a fleet of similar electric trucks for operation at its piers in foreign ports.

One use to which these trucks are often put is the spotting of freight cars. Another use is for piling baled cotton and other heavy materials. This is done by hitching the trucks to block and tackle fastened to roof girders. They are also used for towing boxed automobiles. Special four-wheeled dollies are provided for this work. The boxed machines are raised and the dollies placed in the center and then towed by the truck. This same method is employed in handling machinery weighing as much as 8 and 9 tons.

Piers 35, 37 and others along the north end of the water front are 1000 ft. in length or more, and the problem of shifting from end to end has been solved by many of the steamship men, who now make their way to distant points by utilizing these electric trucks when they are not being used in handling freight. It requires several minutes to traverse the long piers on foot. As the trucks travel at a fair rate of speed, considerable time is saved by the managers and clerks in this way.

One of the largest fleets of industrial electrically operated trucks on the water front, totaling 14 trucks of various types and makes, is operated by the Pacific Steamship Co. This company occupies piers 16, 18, 20, and 24, and considerable freight, baggage and express is carried back and forth between these various piers by these trucks. This is greatly facilitated by using the strip of asphalt pavement that expends along the Embarcadero adjacent to the sidewalk. The pavement was originally built for automobile traffic on the Embarcadero, and is about 30 ft. in width, the remaining part of the Embarcadero being paved with basalt blocks for the use of horse drawn vehicles. This strip of pavement is also used by various other companies in the operation of their electric trucks between piers, the principal ones being the Oceanic and the Pacific Mail.

The charging equipment used by Pacific Steamship Co. is shown in an accompanying illustration and is arranged for charging 12 trucks at a time. There are two panels, one of which was installed by Harbor Board's forces, and the other by Herzog Electric Co. The cars are charged from 4 to 7 hours each night and practically all repairs are made by the company's forces.

The Pacific Mail Steamship Co. operates four Elwell-Parker lift trucks. On pier 42, which is occupied by this company, there has been installed a 4-unit direct-current charging panel built by the Drendel Electric Co. Trucks are put on the charging board for 4 or 5 hours each night.

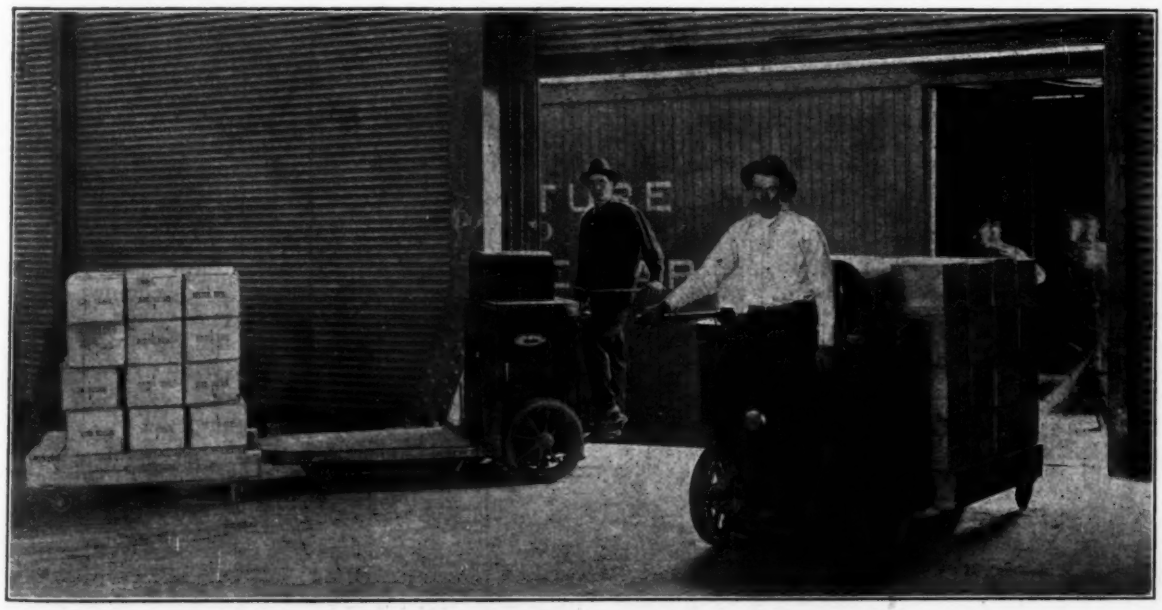
The Matson Navigation Co. operates six Elwell-Parker lift trucks. This company occupies piers 30 and 32. A six-unit direct-current charging panel installed by the Herzog Electric Co. is in use on these piers.

The Associated Terminals Co. and the Schirmer Stevedore Co. have each recently installed an Elwell-Parker truck. The former company occupies a large warehouse at China basin on the southern part of the water front. The latter will use its equipment which is of the lift type at piers 29 and 31 which are occupied by the China Mail Steamship Co. This company has the contract for handling the freight for the China Mail.

American Railway Express Co.'s Installation.

The American Railway Express Co. occupies quarters just south of the Ferry building. The company uses electric industrial equipment to handle all the express between San Francisco and the Oakland Mole, which is now the terminus of the Southern Pacific, Western Pacific and Santa Fe railroads. In this work the company uses 15 industrial electric tractors; two Mercury, one Automatic, seven Elwell-Parker and five Couple-Gear. The Couple-Gear tractors which are manufactured by the Couple-Gear Freight Wheel Co. of Grand Rapids, Mich., are much larger than the others and in addition to hauling trailers also carry a load.

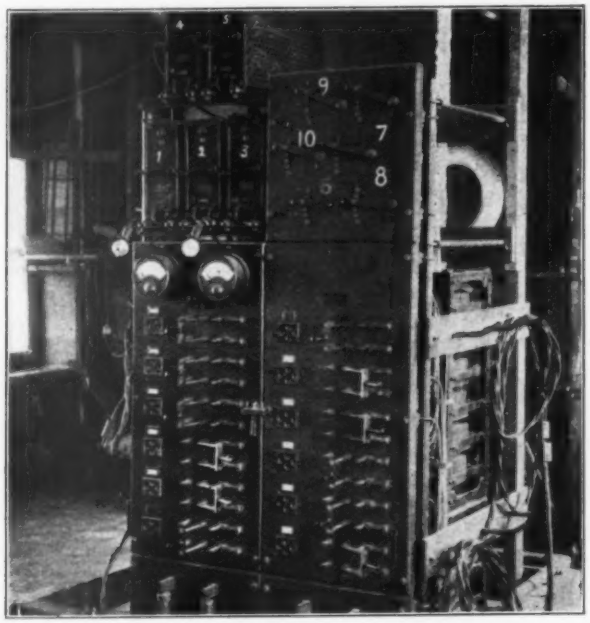
The ten smaller tractors are engaged in towing the four-wheel express trucks to and from the ferries



Unloading Freight Cars with Electric Lift Trucks.

on both sides of the bay meeting every inbound and outbound train. These tractors are capable of pulling a trailer load of 15 tons. The Couple-Gear tractors tow as many as 14 trailers.

The trailers are made up at the company's buildings and operate on a regular schedule. The loaded trailers are pulled up to the ferry slip a few minutes before the arrival of the ferry. After all passengers



Charging Equipment at Pacific Steamship Co.'s Pier.

have left the boat, the trailers are taken aboard and the returning trailers are taken off. Not until this interchange is completed are the gates opened in the Ferry building which permit passengers to go aboard, thus eliminating any possibility of persons being injured by the tractors or trailers.

The smaller tractors are stored and charged in the Express building on the Embarcadero and the Coupler-Gear tractors at Second and Mission streets. Direct current and the proper rheostats and switches are provided at both places.

A daily report is made out by the operator in charge of the charging equipment at the Embarcadero. Readings of the voltage and amperage are taken every hour during the charge and marked down on the report, which is delivered daily to the chief electrician of the motor repair shops, operated by the American Railway Express Co. where all the electric tractors and automobiles of the company are repaired. The men in charge of the charging equipment work in two shifts namely, from 9:00 a. m. to 6:00 p. m., the night shift going on at 11:00 p. m. and leaving at 7:00 a. m. The operators of the tractors work in broken shifts of 8 hours each.

The following is an example of the working and charging schedules of the tractors. The two Mercury tractors haul their loads aboard the ferry for Oakland at 3:00 p. m. and 4:20 p. m., respectively. After disposing of their freight in Oakland and collecting a new load they are returned for charging at 6:00 a. m. Two Elwell-Parker tractors leave for Oakland at 6:00 a. m., one returning at 4:00 p. m. and the second at 6:00 p. m. They are both put on the charging board at 6 p. m. and taken off at 11:00 p. m. This system is necessary to conform with the train schedules.

The Southern Pacific Railway Co. operates two of the latest type of Elwell-Parker tractors, and two Couple-Gear tractors in hauling baggage to and from the Ferry building and ferries, and between trains and ferries at the Oakland Mole.

Edison batteries are used exclusively on the Automatic, Mercury, and Elwell-Parker tractors in use along the entire water front.

The Harbor Board has recently purchased one electric tractor of the type manufactured by the Baker R. & L. Co., Cleveland, Ohio, and a number of trailers which will be used on the water front to supplement the private equipment. This truck which is operated by Edison batteries, has a 10-ton trailer capacity, and a speed of 5 mi. per hr. Three of the trailers have a capacity of 6000 lbs. each. This type has a platform 35 in. by 72 in. Each trailer is equipped with a Y-shaped hook coupling of forged steel, fitted with elongated eyes so that it will rest in a vertical position when not in use. A catch is provided to prevent uncoupling when going down an incline.

The Harbor Board also has on trial a 4-wheel steer industrial electric truck manufactured by the Cowan Truck Co., of Holyoke, Mass. The running motor used with this truck is 38 volts, 60 amp., 1250 r.p.m. The platform-elevating motor operates at 24 volts, 1800 r.p.m. and requires 30 to 35 amp. to lift a load of 4000 lb., but requires no power to lower the load. The motors are equipped with flexible couplings on the armature shaft to prevent breaking should the motor get out of alignment.

These tractors and trailers will be used by various concerns along the water front who do not have sufficient business to warrant the purchase of their own equipment. The state will make a schedule and will furnish a machine and operator, together with trailers, and will charge the user a stated hourly rate for their use. These tractors will also be used in hauling the piling and tiering machines from pier to pier, and from one point of a pier to another.

Another contemplated feature is a portable charging outfit. This will consist of special battery-charging equipment mounted on a four wheel truck, which will be towed to various points along the water front by the electric tractors. Several stations are being provided for plugging-in this portable battery charging equipment.

Novel Use of Electric Conveyor.

A novel type of electric conveyor has been installed on a fleet of barges that are in operation in San Francisco Bay, in order to assist the truckers in pushing the two-wheel hand trucks up the incline from the boat level to the dock. Formerly two or three extra helpers were employed to assist in this work which is especially difficult at low tide. This conveyor consists of a single chain equipped with a number of pushers about 4 in. high which are installed in the center of the truck incline. It is operated by a 6-hp. motor. When the hand truck is run on to the incline the pushers engage its axle. All the workman does is to hold the truck handles as the pushers furnish the power necessary to push the truck up the incline. The conveyor travels about as fast as a man walking briskly. There is no pause at the bottom of the conveyor, as the pushers are placed so close together that the man does not have to wait for the conveyor to engage the truck axle.

Conveyors similar to this are being built by the Miess Goddfried Co. of San Francisco, and are in-

ELECTRIC INDUSTRIAL TRUCKS AND TRACTORS IN SERVICE ON SAN FRANCISCO WATER FRONT.

Name of Company.	Type.	Number.	Manufacturer.	Battery Equipment.*
American Railways Express Co.	Tractor	2	Mercury Manufacturing Co., Chicago	40 G-11 or 40 G-9.
American Railways Express Co.	Truck	2	Couple-Gear Freight Wheel Co., Grand Rapids, Mich.	72 G-11.
American Railways Express Co.	Tractor	7	Elwell-Parker Electric Co., Cleveland	60 A-6 or 42 A-6.
American Railways Express Co.	Tractor	1	Automatic Transportation Co., Buffalo, N. Y.	42 A-6.
Barneson & Hibbard	Tractor .. .	1	Elwell-Parker Electric Co., Cleveland	60 A-4.
Matson Navigation Co.	Lift truck..	6	Elwell-Parker Electric Co., Cleveland	21 G-9.
Oceanic Steamship Co.	Truck	9	Elwell-Parker Electric Co., Cleveland	21 A-6.
Pacific Steamship Co.	Lift truck..	2	Elwell-Parker Electric Co., Cleveland	24 A-6.
Pacific Steamship Co.	Truck	12	Automatic Transportation Co., Buffalo, N. Y.	36 A-4.
Pacific Mail Steamship Co.	Lift truck..	4	Elwell-Parker Electric Co., Cleveland	21 A-6.
Shirmer Stevedoring Co.	Lift truck..	1	Elwell-Parker Electric Co., Cleveland	21 A-6.
Army Transport Dock	Truck	1	Automatic Transportation Co., Buffalo, N. Y.	36 A-4.

*All apparatus listed are equipped with Edison storage batteries.

stalled on cargo aprons of the piers. The electric motor operating these conveyors are housed in special compartments under the pier floor. A friction clutch is provided on the driving gear which slips in case the conveyor becomes overloaded, or in case there is any obstruction in the way, thereby eliminating the possibility of the equipment being damaged. The motor is covered over with a heavy door so that trucks can drive over. This cover can readily be lifted for making repairs to the motor or gear. All lubricating is done from the floor of the pier, however, so it is never necessary to go below except for repairs. There is a flexible slip joint in the chain guide of the conveyor which enables the apron to be raised or lowered to suit the height of the tide.

The safety of the stevedores has been taken into consideration in the design of this conveyor, and provision has been made so that it is impossible for a person to be injured. In this respect it fills all of the requirements of the California state factory inspection laws. In regard to its efficiency, it has been approved by the Harbor Board who made preparation for this installation on pier No. 3 by providing the pits for the motors, and the necessary floor openings when the pier was constructed.

ACTIVITIES OF THE INSTITUTION OF ELECTRICAL ENGINEERS.

Great Increase in Membership and Meetings of British Organization—Plans for Broadening Its Influence.

The English Institution of Electrical Engineers now has a membership of 7023, this being an increase of 356 during the year ended April, 1919. The growing activity of the Institution is evidenced in the large number of meetings held as compared with previous years. For the past year the number was 191 as compared with 153, 148 and 117 in the three preceding years and 159 in the year before the war. Between 1914 and 1919, 2021 members served either in the army or navy in connection with the war. The Electrical Appointments Board, now established as a separate organization, is at present only dealing with the cases of members who have served in the forces; this is due to the limited number of vacancies.

The Institution has a committee sitting to report on regulations for overhead power lines, with a view to reducing the unnecessary high cost and securing the safety of the public of cheaper methods of construction. Specifications for such items of overhead construction as may require them will be prepared by the British Engineering Standards Association.

Among the new committees there is one set up to secure technical co-operation between Great Britain and the British dominions and colonies and foreign countries, for the exchange of experience and information as to engineering practice. In the course of an address to the various centers of the Institution C. H. Wordingham, who shortly retires from the presidency after two years in office, referred to this Technical Co-operation Committee and said that he hoped that foreign countries would set up committees of their own on similar lines. He added that the Institution of Electrical Engineers was not at present doing very much as a body abroad.

"In Canada the American Institute of Electrical Engineers has to a very great extent already captured the field, and anything that we do must be more or less in competition with them. It would be lamentable were a similar position to develop in Australia and New Zealand, or in India. We ought to take a very broad view of the matter, and recognize that we cannot expect these great dominions to be considered as territorial centers, on the same footing as a comparatively small section of the British Isles. We must recognize their national aspirations, and my present view is that each of these dominions should have its own engineering institution, and our members should in some way be affiliated, as a section of this Institution to what I may call the national institution. In those countries in which the total number of engineers is small there might be one national institution for all kinds of engineers; in others there might be enough electrical engineers to justify a national electrical institution. In either case our members in the overseas dominions while remaining members of our own institution, and meeting together, should in some way be affiliated to that overseas national institution, so that Canadians or Australians or whoever they were would feel that they were not joining a purely English institution, but that they were joining a Canadian or Australian institution closely interlinked with our own British Institution of Electrical Engineers. I think it is the duty of our Institution to foster in that way the interests of electrical engineers all over the British Empire, and I think that the matter should be taken in hand forthwith."

HYDROELECTRIC POWER FOR WEST COAST OF AFRICA.

Construction of Plant to Furnish Power for Tin Mines Under Way.

A hydroelectric plant is being built by the Bauchi Tin Mines, Northern Nigeria, which will be used to operate the tin mines. This hydroelectric development will have an initial capacity of 1500 hp., which will be transmitted 12 miles to the mines. The cost of the installation will be in the neighborhood of $400,000. It is estimated that the cost of energy will be about 1.2 cents per kilowatt-hour as compared to 5.2 cents for energy generated from coal or oil. The annual saving which it is estimated will result from this change is $195,000.

Re-awakening of the Electrical Industry
Electric Light

Interview with President-Elect Ballard Setting Forth His Ideas on did Opportunities for Service Looming in Future Must Be Grasped Slogans for the Coming Year's Work — Development of the Asso

SPLENDID opportunities for public service and incidental self-development are now presented to the electrical industry and every branch of this industry needs awakening to the possibilities that lie before it. War problems having been met, the industry must without delay terminate the present hesitancy and readjust itself to meet the greater calls for future service.

Leadership in bringing about the awakening to these greater opportunities and the development that must come therefrom is the province of the National Electric Light Association. The new administration of the Association, headed by President-Elect R. H. Ballard, of Los Angeles, Cal., proposes to take most active measures to this end so as to secure spontaneous recognition of its importance to the electrical industry and to the country as a whole.

Harmonious action within itself and with other branches of the electrical industry is needed to show that the Association truly represents this rapidly growing industry. We must let the people know that the supply of electric power and light is a prime essential to all industry and, in fact, to the welfare of the country in general. The Association must convince the public that it is an industrial organization and has no political axe to grind, that it has a duty to the public in furnishing service to meet the public needs at every point of contact with the public, and that this extends even to rendering service before profits. Central-station companies are public service corporations and, therefore, public servants.

The above are some of the outstanding features of the general policy outlined by Mr. Ballard for the coming administrative year of the N. E. L. A. For some two weeks following the Association's big Atlantic City convention, at which he reluctantly accepted election to the presidency of the organization because of the many personal obligations involved, Mr. Ballard remained in the East, principally near the Association's headquarters in New York City. He held numerous conferences with Retiring-President Wells, the vice-presidents and other officers and prominent members, at which the Association policies and administrative organization were freely discussed.

One outcome of these meetings was already announced in last week's issue of the ELECTRICAL REVIEW. It consists in putting into effect one of Mr. Ballard's distinctive slogans, "Everybody Works." During his administration each of the four vice-presidents will have executive responsibility over an important part of the Association's activities. This change was necessitated not only by the great distance from headquarters of Mr. Ballard's residence in Los Angeles, but by the desirability of making all the executive officers actively share in the Association's work and thus incidentally relieve the president of numerous details so that he may devote his energies to the most important executive matters. This plan is carrying out the administrative system now found necessary in many large corporations in which each vice-president has general supervision over certain departments that report to him. Each of the vice-presidents, Martin J. Insull, Milan R. Bump, Frank W. Smith and Walter H. Johnson, is in keen sympathy with the new plan and has begun to map out his work for the year.

On his way home, Mr. Ballard stopped at Boston, Cleveland and Chicago, spending several days of this week in the latter city, where he kindly gave an interview to a representative of the ELECTRICAL REVIEW on his ideas and policies. Speaking of the executive plan just outlined, he felt that the steady growth of the Association's work demanded active participation therein of all of its executive officers and this would give them a better insight into its activities and needs.

Salient Features of Mr. Ballard's Aims for the N. E. L. A.

FULL REVIVAL of all Association activities and conducting them on a scale greater than ever.

Expansion of the Association through development of geographic sections so as to make the organization truly national and representative of the central-station industry in all the 48 states of the Union.

Representation of the Association at each geographic or state convention.

Stimulating the work of the company sections, upon whose membership depends so much of central-station success.

Changing the administrative organization so that each of the four vice-presidents of the Association has general supervision over certain departments of its work.

Carrying out the slogan, "Everybody works," both in the Association and throughout the industry.

Co-operation with other branches of the electrical industry—manufacturers, jobbers, contractors, dealers—so as to secure much greater development of the entire industry, possibly along the lines of the California Co-operative Campaign.

Fostering of true conservation of natural resources through development of water powers.

Interconnection of power systems to meet the enormous power demands of the future, due to general electrification of railroads and industries.

Demonstrating the idea "Service first."

Letting the public know what high-grade service means so that its appreciation will be spontaneous.

Showing the need for fair return on capital so that there may be secured the additional new capital frequently needed for development work.

Carrying out plans to make employes take personal interest in the utility.

Under the Leadership of the National Association

the Association's and the Industry's Policies and Problems—Splen- by Co-operative Effort — "Service First" and "Everybody Works" ciation and How It Can Serve Both the Industry and the Country

It would also stimulate and make more valuable much of the committee work. Further increase of the work may require the engagement of a permanent executive, such as a managing director, to co-ordinate the work throughout the country and carry out continuous work and policies from year to year instead of letting these become a new task for each year's incoming administration.

Mr. Ballard has decided views on the Association's obligations to eliminate sectionalism and become truly national by representing the central stations throughout the country. "The administration wants to get and will get absolutely in touch with the whole country," he said. "It is planned that, just as far as possible, one executive of the national association will attend each of the conventions of the geographic sections so as to secure the closer co-operation between the sections and headquarters that is so desirable. The entire country should be divided into geographic sections for more effective work. The present geographic sections now represent 18 states. There is no reason why all the 48 states should not have direct connection with the Association. An amendment just voted to the constitution should help materially in bringing in the other states. These geographic or state sections at their annual or semi-annual conventions can take care of practically all the local problems peculiar to their needs, leaving to the national convention the consideration of the broader national problems. Most of the valuable convention features can be handled successfully in geographic conventions so that the national convention can be devoted to the big and broad questions affecting the industry as a whole. It may ultimately get to the point where the geographic sections will elect delegates to the national convention or congress of the Association.

R. H. Ballard, President-Elect National Electric Light Association; First Vice-President Southern California Edison Company.

The company sections are a vital element in the national organization and the president-elect is in hearty sympathy with the views on this subject of Henry L. Doherty, that were so earnestly expressed at the recent convention. Primarily, the company sections should develop interest in and intelligent execution of the work of every central-station employe. "They must first grasp what is meant by 'service'," Mr. Ballard said, "and at every opportunity demonstrate to the public the idea of 'service first.' Teaching the meaning of this can be done best through the company sections which should also develop the men for higher responsibilities. From the local section the men should be spurred to work in the state or geographic section and then the national association."

Mr. Ballard is an enthusiastic believer in the general interconnection of electric power systems which has been carried out so extensively and effectively in his section of the country. "What has been done successfully on the Pacific Coast, where distances are relatively great, can be done as well, if not more practically, in the East and other sections of the country," he declared. "The economies and service reliability resulting from development of water powers and their connection with each other and with steam-driven plants were clearly shown by Dr. George Otis Smith, director of the Geological Survey, in his address before our Atlantic City convention, and I full agree with him that the extensive electrification of railroads and industries of the future with its enormous power demands will also require general interconnection of power systems. To conserve our fuel resources we must make possible the utilization of our water powers to the utmost and on a reasonable commercial basis. We cannot start too promptly on a generous program of power development on a national scale."

Another policy that has worked out successfully on

the Pacific Coast and which Mr. Ballard would gladly see extended to the other parts of the ocuntry is full co-operation between the various branches of the electrical industry. The California Co-operative Campaign has demonstrated that the central station, manufacturer, jobber, contractor and dealer occupy definite economic places in electric service to the public and that the best results to the industry generally, as well as to the public, are obtained by harmonious relations between these essential elements. "Everybody works" is exemplified by this co-operation. Through merely carrying out this idea alone throughout the country, Mr. Ballard foresees decided prosperity to the entire industry.

A simple explanation of the meaning of "Service before profits," as interpreted in California, was offered by Mr. Ballard in answer to a question. The primary obligation of the utilities is there looked upon as giving the service that the public demands. If such service is rendered, the state regulatory commission may be depended on to set the rates so that the company's investors are properly recompensed. At the suggestion of President Wilson and Mr. McAdoo, then Secretary of the Treasury, the commissions last year generally adopted a fair attitude on the matter of providing the rates needed to permit the utilities to continue their essential public service without financial embarrassment in view of the high operating costs.

Mr. Ballard emphatically believes that commission regulation is firmly established and should be maintained. He has no sympathy for the legislative attacks made on the commissions in several states. In general, their work has been wholesome both for the public and the utilities; it has enlightened the public on many utility problems and has served to take utility questions out of politics. There is need, however, for more uniform action on some subjects, such as questions of valuation and the principle underlying the rate of return on capital. The latter must be adequate so as to make it possible to secure the necessary capital for further development of the utility. Investors require that there be an ample reserve for safety of the business. The income, therefore, must be sufficient to provide this reserve above the interest charges.

It is quite a problem among all the utilities to secure the large amounts of capital needed to finance development work. "Here is where the policy of 'Service first' should come into play," declared Mr. Ballard. "We must let the public know that we are here to serve. If our eagerness to serve is appreciated, there also will be recognized, both by the public and the commissions, the necessity to allow fair return on the capital needed for development."

Asked as to his opinion on municipal ownership of public utilities, Mr. Ballard said: "Of course, private ownership with its much higher efficiency and more progressive management is far superior to public ownership. We have seen this demonstrated so clearly that it is no longer a question with anyone who has studied the matter in an unbiased way. We are so convinced of this that we are apt to take it for granted that the public appreciates this as a fact. We must let the public know more about ourselves and our business, our eagerness to give the best service, the value of such service, the large amount of capital needed to render this service, and that this capital cannot be obtained unless there is a reasonable return to the investor. Above all, we must first furnish the service that is needed, and by its quality make the public appreciate it. This done, good will is established, the utility is given fair treatment and agitation for municipal ownership dies out. Throughout, we must remember that 'Works speak louder than words.'

"Giving service at every point of contact with the public requires contented and loyal employes, which means satisfactory compensation for them and, if possible, some method whereby they can share in the profits of the business. Some plan should be adopted that permits the employes to purchase stock in the utility or otherwise obtain a personal interest in its welfare. Many of the large utility corporations, for instance, the Commonwealth Edison Co. in your own city," said Mr. Ballard, "are carrying out such plans and there is no reason why they may not be put into effect by practically all the utilities."

FEDERAL ELECTRIC RAILWAY COMMISSION TO STUDY STREET RAILWAYS.

Announcement was made by Secretary Redfield on June 5 of the appointment by President Wilson of the members of the Federal Electric Railways Commission, the purpose of which is to endeavor to find a solution of the street railway problem throughout the country. The members of the commission serve without pay. It is said that the commission must base its conclusions on information contributed voluntarily since it has no authority to hear and determine specific controversies in any community or in respect to any company. There will be no interference with regulatory functions of state commissions or municipal authorities.

Composing the commission are Edwin F. Sweet, Assistant Secretary of Commerce; Royal Meeker, Commissioner of Labor Statistics, Department of Labor; Louis B. Wehle, general counsel, Finance Corporation; Charles E. Elmquist, president National Association of Street Railway and Utilities Commissioners; Charles W. Beall of the Investment Bankers' Association; Philip H. Gadsden, American Electric Railway Association, and William D. Mahon, Amalgamated Association of Street and Electric Railway Employes.

NORWAY'S ABUNDANT WATER POWER.

According to the *Commerce Reports* issued by the Bureau of Foreign and Domestic Commerce, there is abundant natural water power in the Christiansand district in Norway, which as yet has scarcely been touched. Taking into consideration a minimum development of 500 hp., recent statistics show that there are exploitable power sites of 659,000 hp. in the County of Lister og Mandal and 362,500 hp. in the County of Nedenes. These, with the return of normal times, offer considerable possibilities for the development of artificial industries, for which the raw materials would have to be imported.

COAL MINE TO BE ELECTRIFIED.

The Mendota Coal Co., Centralia, Wash., is arranging to electrify its coal mine at Mendota. Plans provide for installing a 100-kw., 440-volt, 3-phase generator, to be steam driven; and 100 hp. in motors for operating pumps, hoists and ventilating fans. The erection of a pole line for lighting and the wiring of 60 small houses will also be required. An electric-driven mine hoist will be installed for underground service. The two pumps of 30 and 120 gal. capacity, respectively, for keeping the mine workings free of water, will operate against a head of 350 ft.

Electrical Plowing and Mechanical Agriculture in France

Description of Equipment Employed at Meaux, France—Relative Costs of Plowing by Gasoline Engine and Electric Motor—Abstracted from Revue Générale de L'Électricité

ELECTRICAL plowing has been carried on quite extensively in France and Germany during the past three years. It has been found a rapid way of tilling soil, and the cost of doing it has been lower than employing the horse. In America the kerosene and gasoline tractors are finding favor, but it is thought that the central-station companies in going after the rural loads might take under advisement the electric tractor for plowing. The load is a useful one and represents considerable energy consumption.

Advantages of Plowing Electrically.

Electric plowing is superior to plowing by horse from every aspect, namely that of time, of labor and of cost. When compared to the use of steam engines, electric plowing still shows advantages. With the steam engine some form of animal transportation must be employed to carry water and fuel to the engine. With the electric motor, work can go on regularly and without loss of time due to firing up, the work is done more uniformly and the plow is kept at constant speed. The result of this is that plowing is performed at lower cost, at a price previously determinable and that varies little.

The cost of electric plowing depends largely upon the cost of electrical energy, and the lower this cost the lower will be the cost of plowing. The experiments on electric plowing carried on at Meaux, and also statistics collected by M. Dariac, of the Ministry of Agriculture prove that while the cost of energy should be low, a cost exceeding 3 cents per kilowatt-hour does not preclude electric plowing competing with other mechanical plowing methods. If electric plowing is to be successful, it is better to obtain the close co-operation and interest of the transmission companies than to attempt to obtain extremely low energy charges.

Statistics compiled by M. Petit, director, Société Général Agricole show the energy consumption, in kilowatt-hours, to be as follows:

Kw-hr. per hectare (2½ acres)	Depth of furrow in in.	
90 to 100	12 to 11	Deep
45 to 47	8 to 10	Medium
35	6	Shallow

These figures may seem high as regards kilowatt-hour consumption, but it must be borne in mind that the land was "heavy," that is wet and much of it consisted of clay.

Description of Equipment Employed.

The equipment employed at Meaux was specially adapted to agricultural work, being heavily built so as to be able to withstand the rough usage that would be accorded it and to be little affected by the elements and long periods during which it might be called upon to remain unused and exposed to the weather. The equipment consists of five parts, namely two transformer trucks, two tractors and two winches, and the plow. There is ancillary apparatus, of course, such as steel cables, apparatus for handling the high-voltage wires, etc., and flexible conductors.

Tractor and Winch.

The tractors are used for moving the entire apparatus, some of which is carried upon it and some of which is hauled, for example the transformer trucks and the plows. These tractors are designed to travel under their own power, either electric motor or gasoline engine, as the plowed area changes.

Each tractor is built-up of I-sections to form a

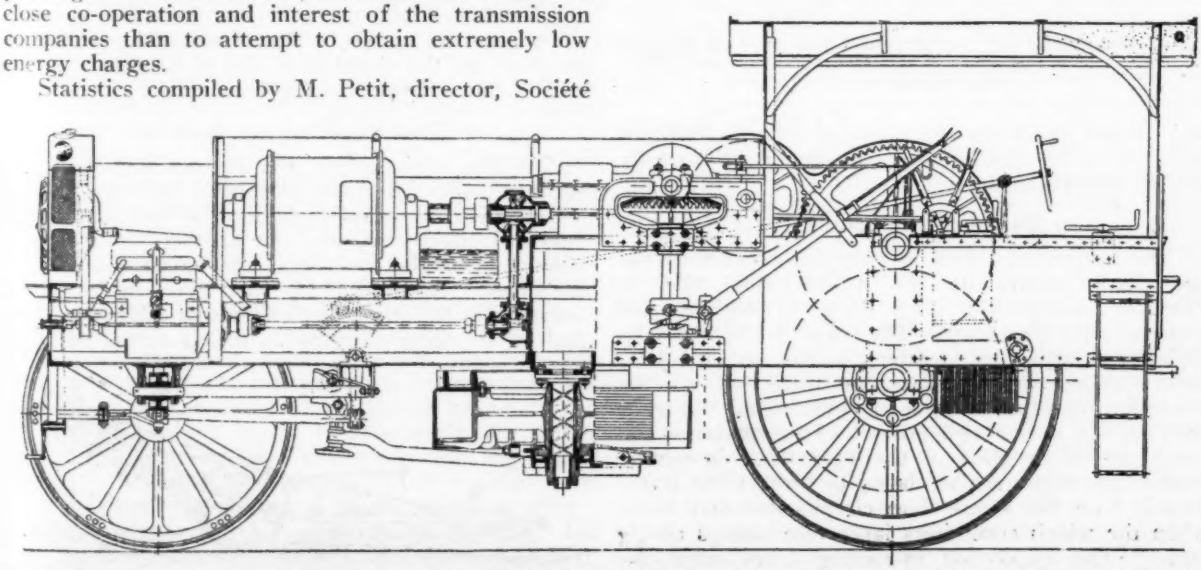


Fig. 1.—Side Elevation Showing Arrangement of Gasoline Engine, Electric Motor, Winch, Control Mechanisms and Apparatus for Locomotion.

strong and rigid wheel base. As shown in Fig. 1 a 30 to 40 hp. gasoline engine is mounted at the front of the tractor and so arranged to drive the winch, located under the chassis frame, or the tractor wheels, according to the position of a leather-cast-iron cone clutch. An 80 hp. wound-rotor induction motor is direct connected to the winch through oil-immersed reducing gears. This motor operates at 960 r.p.m. and develops 100% overload for one minute and 50% overload for five minutes. This motor uses forced ventilation and is enclosed against rain and dirt. It is protected by a 750-volt circuit breaker with automatic trip on overloads.

The wheels of the tractors have special treads to permit of traveling over soft and rugged ground. The front wheels have a diameter of 69 in. and are 18 in. in width, while the rear wheels have a diameter of 86 in. and are 27 in. wide. For moving along short distances parallel with the transmission line, as when plowing is being done, the electric motor is used for locomotion. For traveling away from the transmission line and for moving long distances, the gasoline engine is employed.

The winches or windlasses are installed beneath the chassis so as to exert a pull along a path about 1 ft. above the ground line. The steering apparatus

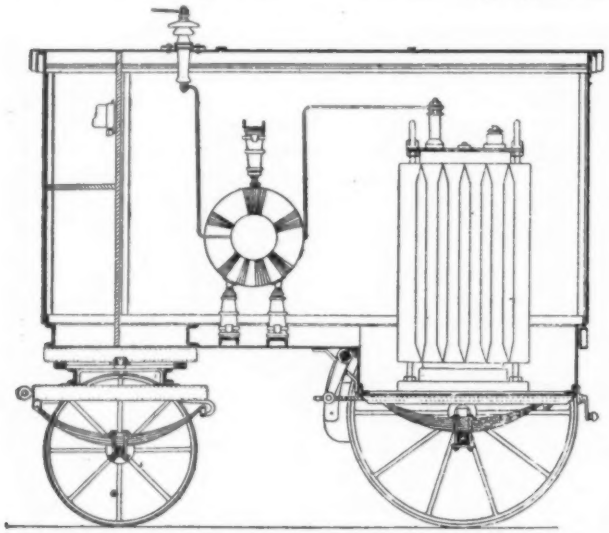


Fig. 2.—Side Elevation of Transformer Truck, Showing 90-Kv-a. Oil-Cooled Transformer, Reactance Coil, and In-coming High-Voltage Line.

and control levers for the motor and engine clutches are seen to be centralized where one man is easily able to manipulate them.

Transformer Trucks.

The transformer used for stepping down the voltage from 15,000 of the transmission line to 750 for actual use is a 90-kv-a. oil-immersed 3-phase shell-type unit. The case is hermetically sealed to prevent "breathing" due to temperature changes, and to keep moisture out of the case and prevent oil from being spilled while the truck is in motion over rough ground. One reactance coil per phase is installed in the 15,000-volt in-coming conductors, their purpose being to protect the transformer from the severe short-circuits that may occur when the winch encounters large tree stumps or big rocks. The 15,000-volt in-coming wires enter the transformer truck through the roof through porcelain bushings, thence to the transformer. The transformer secondaries are fused, but heavily, so as to protect the transformer against failure of the 750-volt circuit breaker on the winch tractor to operate or short-circuits in the flexible cable that connects transformer to meter. A watthour meter, which is energized through

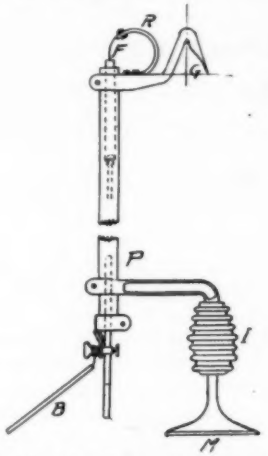


Fig. 3.—Apparatus Used for Connecting Transformer to Transmission Line. Bamboo Extension Rod Not Shown.

current and potential transformers is installed in a partitioned section of the transformer truck.

The transformer truck chassis is built up of I-beams and has a wide wheel base. Sheet iron forms an enclosure of all parts. The chassis is supported by four steel wheels carried on springs.

Special Features of Plow.

Fig. 4 shows the form of plow employed. This is a two-way plow balanced upon an axle and a pair of wheels so that the shears not actively used for plowing are lifted up out of the way automatically. Change in direction of plowing is accomplished quickly, immediately the pull is changed from one winch to the other, all that it being necessary for the operator to do being to change his seat on the plow carriage.

Each plow consists of two sets of plow shears, each of 6 plow shears. Auxiliary shears are installed so that in making specially deep furrows the sub-soil can be plowed and opened up without bringing the sub-soil to the surface. The depth of furrow is determined by the position of the plow shears, which can be changed by changing their angle.

How the Plowing is Done.

To plow a given area, the tractors haul the transformer trucks to their respective locations. Each tractor then takes up its position at one side of the field and directly opposite one another. The cable is wound up on the one winch and payed fully out on the other. The one winch then winds up its payed-out cable as the other winch allows its cable to unwind, and by so doing the plow is pulled across the field.

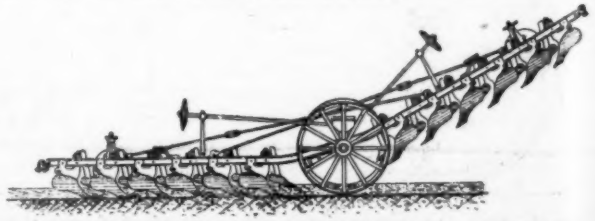


Fig. 4.—Two-Way Plow Used for Plowing by Electrically Driven Winches.

This process is repeated, as the tractors gradually travel along the sides of the field as the plow covers unplowed land.

A flexible conductor, specially heavily insulated to safeguard the workers, connects the tractor with the transformer truck. By arranging the transformer truck advantageously in the direction of travel, movement of the transformer may be reduced to a minimum.

Energy is tapped off the transmission line by the apparatus shown in Fig. 3. This consists of a section of fuse wire inserted through a hollow length of wood, of bamboo, at one end of which is a special connector for gripping the transmission line conductor and at the other end of which is a connector making contact with the conductors that go to the transformer. To "M" connects a long bamboo pole, which the operator holds in his hands. The method of making connection with the transmission line is not altogether satisfactory. The element of danger is present, and the manner of making contact with the transmission line may tend to cause trouble. Outdoor substations are preferable, although perhaps impractical.

The method of plowing employed at Meaux, as described above, enabled an average of four hectares (10 acres) to be plowed per day by two men using the above-mentioned apparatus. The method has been very successful and a greater application is to be expected in the future. During the war it is claimed there were some 1600 installations similar to the above made in Germany. The cost of electric plowing is low, labor is reduced to a minimum, and the work progresses rapidly.

ELECTRICAL CONVENTIONS BEING GENERALLY RESUMED IN ENGLAND.

Many Meetings Arranged for as in the Days Before the War.

Arrangements that are being planned by the English electrical and other engineering societies for the coming six months indicate a general resumption of normal pre-war activity. Whatever electrical conventions were held during the war were necessarily of a very restricted character.

This month the Municipal Electrical Association's convention takes place at Felixtowe, on the East Coast and the subjects to be considered will include Whitley industrial councils for electric central-station systems, the salaries of electrical engineers connected therewith, electric transmission considerations, and the rating of electric supply systems. The British Association for the Advancement of Science, which has not held its congress week for several years, resumes its former practice at Bournemouth in September.

But probably the evidence of greatest electrical activity is to be found in the proceedings now in progress and those in prospect for the coming months by the Institution of Electrical Engineers. Both in respect of the number of meetings, formal and informal, and in regard to the interest taken by members, the Institution has never in all its history been so much alive. On May 14, Major J. Erskine-Murray, Royal Air Force, lectured on wireless in the Royal Air Force. On the following day E. A. Laidlaw and W. H. Grinsted read a paper on the telephone service of large cities with special reference to London. On May 22 the feature was a paper by Dr. S. Chapman on electrical phenomena occurring in high atmospheric levels. On June 3 Senatore G. Marconi lectured on the continuous wave plant at the Carnarvon station, and on June 26 Capt. L. B. Turner will introduce "The Oscillatory Valve Relay: a Thermionic Trigger Device."

The Institution of Electrical Engineers has also arranged a joint conference with the Electrical Contractors' Association and the Association of Supervising Electricians in London to discuss the electrical and engineering equipment of modern small houses. It is further holding a summer meeting this year in Scotland, and the annual dinner and conversazione are both being revived after their war-time suspension.

The same return to normal programs is also noticeable in the case of general engineering organizations, some of which have particularly attractive functions in prospect. As an example may be mentioned a three-day summer meeting of the Northeast Coast Institution of Engineers and Shipbuilders at Newcastle-on-Tyne when diplomas of honarary fellowship are to be presented to Marshal Foch, Sir David Beatty, Sir Douglas Haig, Lady Parsons, Lord Weir and Sir Joseph Maclay. There will be numerous useful papers, including one by Lady Parsons on women's work in engineering and shipbuilding during the war, one by Lord Weir on aviation during the war and its possible future, one by Sir Dugald Clerk on limits of thermal efficiency in Diesel and other internal-combustion engines, and one by G. Constantinesco on transmission of power.

MICA FOR USE IN ELECTRIC CONDENSERS.

United States Bureau of Mines Reports on Growth of Mica Production for Radio Condensers.

The wide use of wireless telegraphy has given a great impetus to the production of high-grade mica. Prior to 1915 most radio sets were equipped with Leyden jar condensers, but subsequently mica condensers as perfected by William Dubilier have largely replaced them. Mica condensers consist of 1000 or more sheets of mica alternating with sheets of foil, the whole being inclosed in an aluminum case. They have the advantages of low power loss, small volume and durability.

As a result of the imperative demand for radio sets for military purposes, about 50,000,000 sheets of mica were used during one year of the war. With the return of peace the wide application of wireless telegraphy to commercial uses will undoubtedly command a strong and steady market for condenser mica.

Condenser mica must be of the highest quality. It must be free of iron compounds, air bubbles, pin holes, cracks or other defects or impurities that impair its dielectric strength. In this connection it is of interest to mica producers that for the most exacting demands in condenser manufacture high-grade domestic muscovite compares favorably with India or other foreign mica. It is claimed, however, that as a rule the domestic product is less carefully trimmed and graded than the imported material and is on this account less in demand. With the assurance that domestic mica possesses essentially the same inherent qualities as foreign mica for this new and important use, it is to be regretted that the method of treatment places it on an unfavorable commercial basis.

The Bureau of Mines offers the suggestion therefore that mica miners and manufacturers give careful study to the question of trimming, grading and classification, and make every effort to prepare their products in forms favored by users of manufactured mica.

The Importance of Electrochemistry

Rapid Growth and Commercial Value of Electrolytic and Electrothermal Processes—Possibilities as Central-Station Load—From N. E. L. A. Atlantic City Convention Address

By JOSEPH W. RICHARDS

Professor of Metallurgy, Lehigh University; Secretary, American Electrochemical Society.

THE chemical industries deal with the problems of taking the raw materials of nature and making them more valuable. Take common salt, which costs about $2 a ton as it is taken out of the mine, and we convert it into caustic soda and chlorine, about half a ton each, which are together worth $45 or $50. Take common water and we convert it into hydrogen and oxygen, each of which has considerable commercial value. Take the air and by means of electrical methods we convert the oxygen and nitrogen into nitric acid. These are samples taken at random of how the raw materials of nature are converted into more valuable materials for commercial use.

Metallurgy is one of the branches of chemistry. The function of the metallurgist is to take ores in which the metals occur in nature and extract from them the metals so that they may be usefully applied. When, in the course of metallurgical operations, you use an electric current, either for its electrolytic power or electrothermal power, you have an electrometallurgical operation. As illustration of this, it is possible, and in some few countries profitable at the present time, to make pig iron directly from iron ore by means of the electric furnace. It is almost everywhere profitable to refine impure copper into pure copper by means of electrolytic operation. We may therefore say in general that electrochemistry deals with using electrical energy to convert the raw materials of nature into more valuable materials, such as extracting metals from the ores, refining the metals, and similar operations which render them of value.

The Two Classes of Electrochemical Industries.

The electrochemical industries may be divided into two broad classes, according to the way in which you use the electric current—I, electrolytic processes, and II, electrothermal processes. The difference between these is this. If you send an electric current (it must be a direct current) through a liquid, you can decompose the liquid. The electric current is an extremely active and powerful chemical decomposing agent. If you have the conditions right in sending a current through an anode to a cathode, through an electrolyte, you can split the compound up into its constituents. There is no chemical compound that cannot be split up by the electric current; in fact, the electric current is so powerful that it requires less than 10 volts to break up the strongest chemical compound known.

Therefore, electrolysis puts in to the hands of the chemist an extremely strong agent, very frequently a simple agent, by which he can break a compound into its constituents in a way in which he cannot do it by any ordinary chemical operation. This principle has been the basis of a large part of the electrochemical industries. In such cases the operation requires very little voltage, but the output of the operation is proportional to the number of amperes that go through the cell; it is not proportional to the energy employed, but proportional to the number of amperes. If you get anywhere near 100% ampere efficiency.

Speaking broadly of the other class, the electrothermal class is made up of those operations in which we use the electric current only, or principally, for its heating effect. The advantages which the electric current gives us in that respect are these: First, you have a heating agent which is absolutely under your control; second, you can generate the heat almost exactly where you want it, and utilize it at high efficiency. If you want to heat substances by ordinary means, coal or gas, it is very seldom that you obtain more than 10 to 20% efficiency in heating. The maximum efficiency of heating that I know of in metallurgical operations using fuel is in melting pig iron in a foundry cupola; the maximum efficiency of heating there obtained is about 35%. In melting steel in a crucible the efficiency is about 2%. Between these extremes you have the ordinary efficiencies of applying the heat through coal and gas. But electrical heat is generated so much under your control, just where you want it, that you *start* with efficiencies of about 35% and run up to efficiencies of nearly 90% of the energy of the current actually usefully utilized, averaging between 50 and 75%. It is because of that very high efficiency of utilization of electrical heat that it is possible to use electricity in these electrothermal operations, because electrically generated heat, except under very unusual circumstances, costs a great deal more than the same amount of heat generated by means of fuel.

There are only a few places in the world where the electrical heat is cheaper than other fuel heat, such, for instance, as parts of Norway, where electric energy can be purchased at $7.50 per horsepower-year, or $10 a kilowatt-year, and where coal costs from $15 to $20 a ton. Under such conditions you can heat houses by means of electrically generated heat cheaper than you can by coal. Those are exceptional conditions, but ordinarily electric heat is commercial only by reason of the greater efficiency at which we apply it

The Electrolytic Industries.

We will briefly classify the electrolytic industries—what are they and what are their extent? The original electrolytic industry is electroplating. In electroplating operations you have a slab of pure metal, which you use as an anode, put opposite the object to be plated in an electrolyte which contains the metal which you are to deposit as a plating, and passing the current you plate it with the metal from the solution. This is a large industry, as you know. Think of the extent of the gold and silver-plating industries and the nickel-plating industry. These industries are nearly one hundred years old. Silver and

gold plating was first done with batteries, before the dynamo was invented. Since the invention of the dynamo these industries have extended their operations very greatly.

These industries are very largely distributed throughout the country. The usual small electroplating plants consume small amounts of power, but there are some large electroplating plants which consume considerable energy. As far as concerns central-station power, almost all of these electroplating plants run on one shift of ten hours a day, and therefore they do not require power continuously. It can be arranged with them to take the power mostly in the "off-peak" hours; when they wish to work overtime it should be done after midnight, in the early morning hours, instead of before midnight.

Besides plating for simply decorative purposes, plating is done for commercial purposes; for instance, electrogalvanizing, that is, the electroplating of zinc. You are familiar with the electro-zinc-plated conduits used in commercial wiring. That is a use of plating to put a covering on these conduits to prevent corrosion. Such plants are, in general, run on a somewhat large scale, and consume more power than those which merely do plating for decorative purposes.

Out of the electrolytic plating industries grew the electrorefining industries, which are commercially of much more importance and consume a great deal more power. The electroplaters used a nearly pure metal anode to renew the bath, but if the anode was impure there was a residue of impurities left of the bath. The Elkington Brothers in England were plating copper and observed that the impurities in the copper, particularly silver and gold, fell down in the mud in the bottom of the bath. Then the thought came to them: Why not use this method of plating metal from anode to cathode as a method of refining it? From this arose then the electrolytic metal refining industries. These are all based on the principle of taking as anode the impure metal you want to refine, putting it in a solution of salt that contains the metal, passing direct current through the bath, depositing it as pretty nearly pure metal, and leaving the bulk of the impurities as mud or unattacked residue to fall to the bottom of the bath. Some of the impurities will go into solution, such as nickel, zinc and iron, but when using a copper anode, the platinum, silver and gold stay in the mud and are completely recovered. That is the principle which lies at the foundation of the electrolytic refinement of copper.

The same principle has been applied to the electrolytic refining of silver, gold, lead, zinc, tin and several other metals, but that of copper is the principal one. Over 90% of all the copper made is put through the electrolytic refineries. There is one refinery near New York, for instance, that refines over 500 tons of copper in a day when in full operation, representing about $150,000 worth of copper a day in one refinery. The question of the supply of power to such an industry is very important. The power required in such large plants runs into the thousands of kilowatts, and as far as central-station men are concerned, that power is usually considered as constant for 24 hours a day, and it is a 100% load-factor.

I wish to state, however, that I do not think that the electrochemists, I mean the men running such electrolytic refining industries, have worked out as far as can be done the possibility of running for certain hours a day on reduced power. In many plants where the current is steadily used for 24 hours a day it would be quite possible, in my opinion, to reduce current materially for a few hours a day without any damage except reduced output. If you do that, your overhead expenses go on just the same, and therefore it costs money to do it, but you must balance the loss against the gain. It is a question for the central stations to decide whether they can make great reductions if they furnish the current fully during, say, 20 hours a day and, say, for 4 hours a day at two-thirds to one-third full current, in order to keep the operation running. Metallurgically, I see no reason why it cannot be done, but it is a question of balancing financially the advantages against the disadvantages.

I know of a very large copper-refining plant which, before it put up its own power plant, tried to make arrangements with the local city power company to secure the power needed on the basis of reducing the amount of power which it would take at certain hours. The arrangement fell through, because the parties concerned did not thoroughly understand each other, and did not quite go to the bottom of the proposition, and analyzing the problem and getting into their minds exactly the differences which would be caused by the proposed arrangement. I know that the electrochemists were anxious to make the arrangement with the power company, but I think there were faults on both sides; each side did not go to the bottom of the problem as it should have done.

Next in line to these electrolytic processes are those which *extract* metal from a compound. There are opportunities of using the electrolytic power of the current in getting the metal from its ores, and these methods are being rapidly extended at the present time. One of them, which you will understand very easily, is, for instance, in the extraction of copper from its ores. Most of the ores of copper are insoluble in water, but you can dissolve them in acid. There is a large mine in Chile, in which the ore is easily soluble in dilute sulphuric acid. The ore is crushed and placed in vats holding about 1000 tons at a time, and leached with sulphuric acid. This brings the copper into solution. Then the solution of sulphate of copper is taken to decomposing tanks with unattachable anodes—a sheet of lead with 4% antimony does very well—and a current passed through. The current takes the metal from the solution, extracts it in a pure state, and deposits it on the cathode as pure copper and leaves in solution sulphuric acid. The solution is then ready to go back to the tanks and take up some more copper, so that the acid is used over and over again. Oxygen gas is liberated at the lead anode, which lasts many months.

That sounds almost too easy to be true, but it is true. The Chile Copper Co. is working it on a scale of 10,000 tons of copper ore a day, and it is probably making copper cheaper by that method than any other copper-producing works in the world. This is a much simpler operation and cheaper operation than any other that could be applied to the handling of that ore.

The same principle has been applied to the extraction of zinc. Within the last five years large plants have been put up in this country and abroad for the extracting of zinc. The chief ore of zinc is zinc sulphide, which is insoluble in water, but if you roast it carefully you can convert part of the zinc sulphide into zinc sulphate, which is soluble in water, and leave part as zinc oxide. You take the zinc sulphate solution, pass it through the electrolytic cell, deposit the zinc, and leave the sulphuric acid. That acid can be used to leach the residue of the ore, which contains zinc oxide, and will dissolve out the rest of the zinc.

The solution is electrolyzed for its zinc like the first solution.

Plants to treat zinc in that way have been put up on a great scale. At Great Falls, Mont., a plant with a capacity of 200 tons of zinc a day has been erected. Several million dollars were put into it, but the price of high-grade zinc went so high during the war that the plant was paying for itself every few months it was in operation. Electrolytic zinc is far purer than the ordinary zinc made in retorts, and is so pure you can use it in making the finest quality of brass for cartridges, whereas, most of zinc is not fit for making that quality of brass. It runs 99.98% pure and commands a higher price than ordinary retort zinc.

This industry is rapidly extending. I am speaking of industries that have but recently been put in operation. The electrolytic extraction of copper from its ore by the use of electric current, and the electric production of zinc are at the present time rapidly extending, so that you will see more and more about them in the transactions of the societies which interest themselves in electrochemical processes.

Gold is another example of a metal which can be extracted from its ore in this way. You can take a gold ore, treat it with a potassium cyanide solution, which dissolves out the gold, and then precipitate the gold from the solution by means of electric current. Gold and silver can both be extracted in that way.

Another variety of the electrolytic processes is the conversion of cheap salt into more valuable chemical products. I am not speaking now of extracting metals, but the converting one compound into the other—general chemical processes. I have already mentioned salt. There has grown up a large industry for the manufacture of caustic soda and chlorine. Many works are devoted to this industry, with millions of dollars of capital invested, and they menace very seriously the older chemical plants, which work on the non-electric method and which represent an investment of probably $100,000,000. These plants are springing up in various places, particularly where they have cheap salt, like in central New York, near Detroit, in West Virginia, and other places.

We take the salt, dissolve it, and pass through a direct current, getting out at the anode chlorine. This chlorine is piped off, and you all know the very many uses of chlorine gas. It has helped very materially in the winning of the war. The uses of chlorine are only beginning to be touched. There will be probably five or ten times as much used in the near future as is being used now, because of the extension of the uses of chlorine in all sorts of industries, the purification of drinking water, sterilization of sewage, disinfection, etc.

At the cathode you obtain a caustic soda which can be converted into carbonate of soda by a simple chemical operation, and so you have the caustic soda industry and the carbonate of soda industry, directly following from the electrolyzing of common salt by the electrotytic method.

I will merely mention some of the other processes of a similar nature which have grown up from the electrolyzing of salt to produce more valuable salts. If you electrolyze common salt solution under different conditions, you can get sodium hypochlorite, a valuable bleach used in the cotton, textile and paper industries. Electrolyzing it again under a little different condition you convert it into sodium chlorate; all the chlorate used on matches is made in that way. Electrolyzing it under still different conditions, you get sodium perchlorate, which is extremely valuable for its antiseptic and oxidyzing qualities. Other salts, such as permanganates, perborates, percarbonates, persulphates, are made by similar processes. These are all methods of converting a cheap solution of a cheap salt into a much more valuable product, which has a great variety of uses.

The iodoform which is at the present time used so much in medicine is, I believe, made electrochemically, from a solution of potassium iodide and iodine in the presence of alcohol.

Another application of the electrolytic method, used somewhat differently, is the production of gases. You can electrolyze water which contains some sulphuric acid or a little caustic soda and produce hydrogren and oxygen. Many plants have been erected in different parts of the country to get hydrogen and oxygen for blow-pipe work, and in general for various chemical operations. Ozone can be made in the same way by a little variation of the process. Chlorine is made as a by-product of the caustic soda industry and is made in extremely large amounts. The sterilization of water and sewage can be achieved by electrolyzing them in the presence of a small amount of sodium chloride, and when the chlorine is generated it entirely sterilizes them. These methods are being extended rapidly.

There are other electrolytic operations where you pass a current through a fused salt, usually around redness. If you melt and electrolyze sodium chloride under correct conditions, you get chlorine at one pole and sodium at the other—metallic sodium. Metallic sodium, which is high-priced, is obtained directly, with chlorine as a by-product.

On the other hand, aluminum, which is now made in such tremendous quantities, is made by electrolyzing a huge bath in which alumina is dissolved—the oxide of aluminum. It is dissolved in a salt called cryolite, which melts at a bright red heat. You pass the current through the melt and get oxygen at the anodes (burning them to carbon monoxide) and aluminum at the cathode. That is the way in which all aluminum is made. This process has reduced the cost of making aluminum from about $2.50 a pound to less than 15 cents a pound. The size of the aluminum industry is indicated by the fact that there are probably 400,000 hp. at work in the United States making aluminum at the present time, and the chief company which is making it is developing a water power of 400,000 hp. more in eastern Tennessee, in order to double its output.

These processes I have just spoken of are essentially continuous, 24-hour processes. When you have to employ a current to melt the electrolyte, and to keep it melted by its own resistance, you cannot let up on the current more than a few minutes at a time, because any stoppage of current would allow the bath to freeze solid. Sodium, calcium, magnesium and cerium are all produced by methods resembling that used for aluminum.

The Electrothermal Industries—Electric Furnace Work.

I have exhausted what I have to say about the electrolytic methods and will now turn to the electrothermal methods, giving a description of them as briefly as possible. I am now referring to the methods where the current is used solely for its heating effect. Many people who have not studied the question closely think that an electrical apparatus that is used for its heating effect must necessarily be run at a very high temperature. While it is true that you

can get a higher temperature with an electric furnace than in any other way, you can also run an electric furnace at a low temperature or moderate temperature, and the range at which they are run has been cut down until we use them to melt ordinary metals, tin, zinc, brass, etc., as well as for melting steel, and also for temperatures which approximate the volatilizing point of carbon.

Let me say of the electrothermal methods, in general, that in them you use the electric current for its heating effect, and when you are informed that the useful effect thus obtained is proportional to the amount of electrical *energy*, and not proportional to the amperes used, you see on what an entirely different basis from the electrolytic methods we are working. The product of volts by amperes represents the amount of electrical energy which has been absorbed, and you figure it out on that basis. High amperes and low volts, or high volts and low amperes—it does not make any difference as long as you get electrical energy into the furnace. In electric furnaces you can use alternating current or direct current, generally the former because it is cheaper and cannot have one-sided effects, but in electrolytic operations you must use direct current only.

We have two fundamental types of electric furnaces, the arc and the resistance. In an arc furnace the current jumps through a gap in the air in the furnace. There is a break in the circuit and therefore you have an arc. Speaking of the history of this process, experiments began a hundred years ago, using the battery and small carbon pencils. Now the electric pencils have grown to electrodes 24 in. in diameter and 7 ft. long, and it is also interesting to note the growth which has taken place in the size of electric furnaces, and the scale on which they are operating. They have grown from little bits of experimental things in the laboratory to furnaces of 15,000 kw. as a maximum.

How can we use the electric arc for chemical operations? We can, as one simple method, bring the substance right into the arc and heat it nearly to the temperature of the arc. For example, pass air through it rapidly, and as it goes through and comes out again it is rapidly heated and cooled; part of the oxygen and nitrogen combine with each other, and there you have the basis of the process for the fixation of atmospheric nitrogen.

The commercial importance of this industry may be realized from the following instance: I have visited a mountain valley in Norway where ten years ago there were a few farms, with a big waterfall, some 2000 ft. high, at the upper end of the valley. Two years later a town was there with 10,000 inhabitants, two power stations of 175,000 hp. each and a large manufacturing plant, looking like an industrial town of eastern France. That was in central Norway, and the nitrate fertilizer there made was being shipped as far as the sugar plantations of Hawaii. That plant for the fixation of nitrogen of the air and production of nitric acid was built largely by German capital, because the Germans realized the importance of having an artificial method of making nitric acid. The method of making nitric acid developed there enabled Germany to keep in the war for four years, whereas otherwise she would not have been in the war over four months; it was their salvation when their supplies of nitrates from Chile were cut off. The war quickly exhausted their stock of nitrates, and they would have had to throw up their hands inside of six months if it had not been that they quickly put up in Germany numerous plants for the fixation of nitrogen and the production of nitric acid. At every place where a little power could be spared they put in a nitric acid plant, and it is estimated that they put in nearly 500,000 hp. of these plants and spent $100,000,000 inside of six months in putting up these plants, thus saving the nitric acid situation.

The arc furnaces used are built to a capacity of 2000 kw. The arc is spread out by means of magnets, so that it is a flat disk 6 ft. in diameter, and they call it the "Electric Sun." The air is simply passed through the arc.

Another use of the arc furnace is by plain radiation from the arc to melt substances brought near to it; in other words, taking two electrodes, with a heavy arc between, bring the metals close to them, and melt them by heat radiated by the arc. The arc also radiates heat against the roof, and this is partly reflected back to the metal. These arc radiation furnaces, however, have been built up to 1000 kw., and metals can be melted in them by the ton. Steel furnaces up to six tons capacity have been operated on this principle.

There is another kind of arc furnace, where the charge itself forms one pole of the arc. They are a little bit more complex in action. You may have, for instance, electrodes passing downward into a steel furnace, the bath of steel itself forming one other pole of the arc. The material is heated partly by resistance but principally by the arc at its surface. There are hundreds of furnaces of that type in operation. We have several kinds in this country, but the principal one is the Heroult, in which three electrodes pass through the roof of the furnace and the current runs from one electrode to the bath underneath and then to the other electrode, using three-phase current. The surface of the bath is kept hot principally by the arcs playing on it. Furnaces working on that principle are in operation up to a capacity of 30 tons. I was talking to a gentleman recently who was operating some of these furnaces, and he agreed that there is no reason why one should not build 50-ton furnaces if it was desirable. Such a furnace would take 3000 kw.

The most important thing in the metallurgical field at the present time is the development of these electrical steel furnaces. It will not be long before all the steel made will be put through an electric furnace before it is finished. You can make in them steel which approximates or equals in quality crucible steel, but in the other processes the Bessemer and open-hearth, you cannot duplicate the electric furnace product.

The United States Steel Corp. will be turning out 20,000 tons of electric steel a month in the near future, using the electric furnace to finish steel made first in the Bessemer converter, nearly finished in the open-hearth furnace, and given its finishing touches in the electric furnace.

In finishing steel in the electric furnace you can get it perfectly unoxidized, since air does not have an opportunity to get in; it is not needed; whereas, in a furnace heated by gas you must have gases passing through to heat it, and they spoil the quality of the steel. The electric furnace can be closed air-tight, producing a steel comparable in quality to crucible steel, or anywhere in between the quality of open-hearth and crucible steel. The electric steel industry will increase very rapidly; it has increased in the United States in the last five years from about 30 furnaces making electric steel to 250 or more. The steel

makers have been simply "falling over themselves" to put in electric furnaces.

Time is lacking to describe the resistance class of furnaces, wherein, like an incandescent filament, a large resistor converts the electric energy into heat. This resistor may be the substance itself being treated or a solid resistor like a carbon rod, or a mass of granular carbon, the substance being heated by contact with or radiation from the resistor. This class includes the induction furnaces where the resistor is heated by a secondary induced current, such a furnace being really a transformer with a secondary of one turn. It includes the electric pig-iron furnace, which is commercially profitable in Norway and Sweden, also the various electric heating furnaces of the Baily type, which are at present making a great stir in the steel industry.

I can mention only briefly a few other operations or processes which are of much commercial importance and which consume large amounts of power. For instance, we have the carborundum furnaces at Niagara Falls. Carborundum cannot be made in any other way but by the electric furnace. There are the ferro-alloy furnaces which produce the ferro-alloys, a wonderful series of molybdenum, chromium, vanadium, and silicon alloys which are used in making the valuable alloy steels, of which you know the uses. That industry is growing rapidly and consumes large amounts of power. The calcium carbide industry alone uses nearly a million horsepower, but must be dismissed with mere mention.

We have also electrical heating furnaces not meant to melt metals but simply to heat them—a large variety of interesting furnaces. It will be but a short time before all the brass in this country will be melted by electric furnaces. It will not be long before most of the heat treatment of steel, that which is preliminary to hardening, tempering and annealing, will be done electrically.

You will notice that there are essentially two kinds of operations which I have spoken of: some are continuous and some are intermittent, and of the continuous processes, some are actually 100% load-factor. The discontinuous processes can be operated for a short time and then discontinued. There is a little steel furnace near my home that operates from 12 o'clock at night until 4 o'clock in the afternoon, and during peak hours they practically shut off their current. Many of the continuous processes could, I am sure, operate on reduced current in "peak" hours, if it were made sufficiently attractive to them to do so by a special low power rate.

I am forced to admit that the electrochemist and the electrometallurgist have not studied their power problems as they should have done. They have not gotten together with the central-station men on a broad basis of enlightened discussion. Perhaps there is blame on both sides. The electrochemists have not studied out their questions thoroughly on the possibility of using intermittent power, like running a batch of steel, and still less thoroughly on some of the continuous operations where the power might be reduced for a few hours and brought up again. I think those are particularly the directions where electrochemists have not fully realized the possibility of using central-station power.

In conclusion, I believe the best hope central power stations have of raising their power-factor and smoothing over the peaks and valleys of their load curve, lies in close co-operation with the electrochemical and electrometallurgical industries.

THE COPPER SITUATION AS REPORTED BY BUREAU OF MINES.

Domestic Production at Rate of About 110,000,000 lb. Monthly—Imports Exceed Exports by 50%—Consumption Only 30% of Production.

Surplus copper stocks in the United States amount from 1,200,000,000 to 1,500,000,000 lb. as compared to a normal surplus of 600,000,000 lb. England is reported to have 114,531,000 lb. and France and Italy together had, at the date the armistice was signed, 300,000,000 to 400,000,000 lb., which was the apparent cause for the restrictions on imports of copper into France and Italy. This surplus has undoubtedly decreased considerably, as France has recently lifted the embargo on copper imports. This would indicate that Europe will soon be in the market for copper, thus greatly helping the American industry. The United States Government is reported to have stocks of copper amounting to 140,000,000 lb. From this stock 5,000,000 lb. was recently sold at the market price, although this copper was bought at 26 cents.

Copper prices appear to be firm at 16 to 16¼ cents a pound. This price will enable most producers to operate, although in many cases below the actual cost of production where all allowable charges are considered. Recent sales were reported as high as 17 cents but it does not appear likely that this price will hold, although some observers predict 20-cent copper in the near future.

The United States is producing about 100,000,000 to 120,000,000 lb. of copper a month, as compared with about 150,000,000 lb. in 1917 and 1918. Practically all copper mines are producing at only 60 to 80% of the rate of last November, one noteworthy exception being the Mohawk, which has increased its production about 20%. Although the majority of mines show a reduced output, several large companies show an increase in April over March, the principal ones being Utah, Inspiration and Nevada Consolidated.

The production at present is about the same as before the war. However, the consumption is low and about 100% more copper is produced than is being consumed. The domestic consumption and the exports must be doubled before normal consumption is reached. This can be accomplished only when the world market is opened and conditions in Europe are settled.

The total exports of copper and copper shapes for April amounted to 22,569,827 lb. The total imports, by copper content, during the same month were 33,287,053 lb. This indicates a peculiar situation; the imports exceed the exports by 50% yet there is a domestic consumption for only 30% of the domestic production.

The purchases for May include, according to reports, wire bars, bought by England and 200 tons of electrolytic copper bought by Japan. This latter item has caused considerable comment and speculation as to its significance. Spain is reported to be in the market for 4,000,000 to 5,000,000 lb.

RAILROAD ELECTRIFICATION IN CHILE.

The government of Chile has authorized a credit for the electrification of a large part of the railway system of the country. This is a project of major importance, which will put the Chilean railways in a position of advance over all others of South America, not excepting the Argentine.

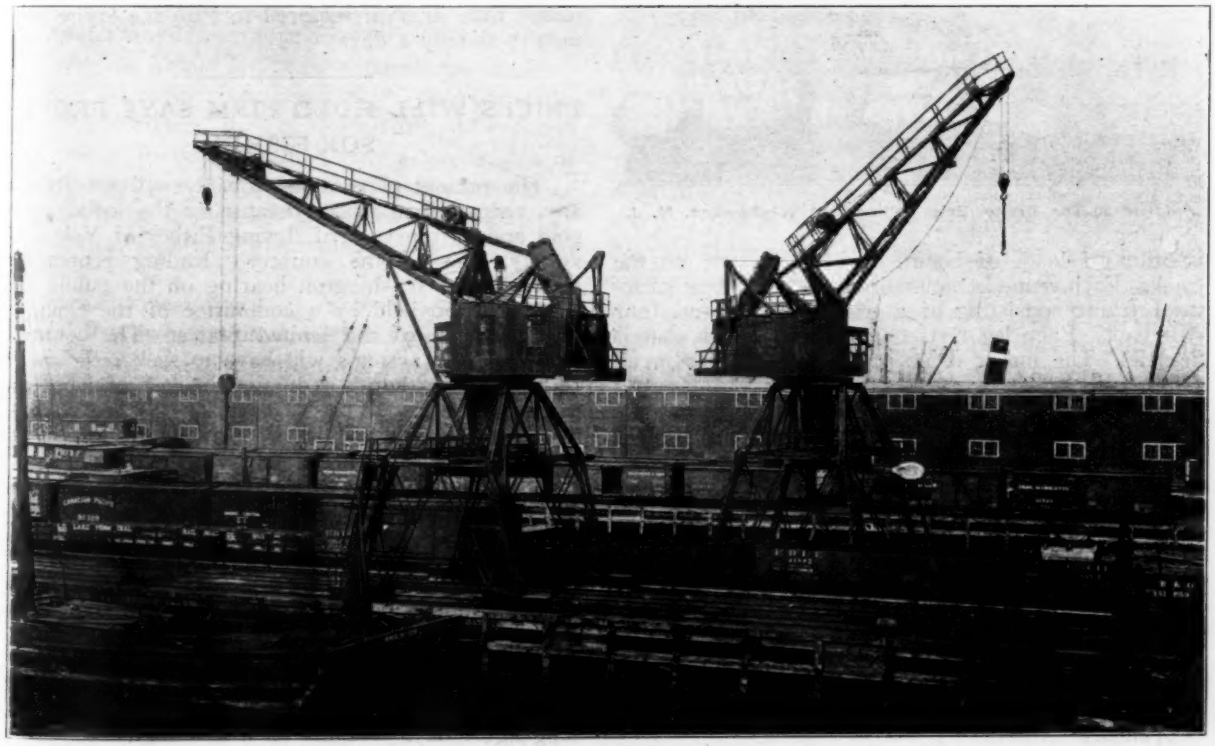
Electric Freight-Handling Cranes Prove Economical for Railroad

Large Portal Cranes Load Heavy Machinery from Cars to Ships at Weehawken Terminal of Erie Railroad — Time and Labor Saved

INSTALLATION of specially designed pier equipment for handling heavy pieces of freight at the Weehawken, N. J., terminal of the Erie Railroad permits that railroad to load freight for ocean shipment more rapidly and cheaply than it has ever been loaded before in the New York harbor. The reduction in the time required to load heavy freight aboard ship, or to unload it, is obtained not only by reducing the actual amount of time required to load the freight on ships, but also by eliminating the necessity of the extra work involved in lightering. Shipping companies touching the New York and New Jersey ports always have lightered freight shipped in heavy packages, because of the absence of suitable terminal loading equipment. The extra work required to load the freight from piers to barges by floating derricks, to tow the barges and derricks to a ship, and then to transfer the freight from the barge to the ship by means of a derrick, has involved an item of expense that has been considerable. The installation of the heavy cranes at the Erie terminal has reduced the cost of handling heavy freight more than half by making it possible to load the freight directly from cars to ships, or vice versa.

The terminal arrangement at which the loading is done at Weehawken consists of an open type pier of wood construction, designated as pier H. The pier, which is 80 ft. wide and 1000 ft. long, supports five standard-gauge railway tracks and two crane tracks extending the full length of the pier. The centerline of railway track No. 3 coincides with the centerline of the pier. The distance between the centerlines of tracks No. 2 and No. 4 and that of track No. 3 is 18 ft., whereas, the distance between the centerlines of the two north tracks and between those of the two south tracks is 12 ft. The edges of the pier are 12 ft. distant from the centerlines of the outer tracks. Crane tracks straddle the two outer railway tracks. The outer rails of the crane tracks, the gauges of which are 28 ft., are 4 ft. from the edges of the pier.

Four traveling portal gantry cranes, electrically operated, built by Heyl & Patterson, Inc., of Pittsburgh, comprise the loading equipment mounted on the pier. The capacity of three of the cranes is 10 gross tons each, and that of the other crane is 20. All cranes have a vertical, or hook lift, of 90 ft., 60 ft. of which is above the base of rail and 30 ft. of which is below that datum. Minimum clearance between base of rail and bottom of boom in lowest position is 55 ft. All of the cranes, which are free to revolve about their vertical axis through complete circles, have a maximum radial reach of 48 ft. 6 in., 30 ft. 6 in. beyond the edges of the pier. The elevation of the boom permits sufficient clearance over the edge of ships to prevent interference between the freight being loaded and the sides of a ship, and the length of



Cranes on Pier H, Erie Railroad, at Weehawken, N. J.

boom permits lifting freight from cars on any track and placing it on cars on any other track, or in the holds of ships.

Each crane is equipped with three 230-volt, series wound, direct-current motors, one for traversing the crane, one for turning the boom, and one for lifting the load and for raising or lowering the boom. Capacities of the motors are: for traversing, 25 hp.; for turning, 33 hp., and for hoisting, 81 hp. The operator's cab, which is heated by electricity, is situated above the portal so that the operator can look down on all operations. Control equipment for operating a crane consists of drum controllers for the travel and the rotating motors, and a master controller for the hoist or lifting motor. A full complement of automatic brakes is provided for maintaining any

Baldwin 50-Ton Crane, Erie Railroad, at Weehawken, N. J.

position of load, of boom, or of the crane on the track. Each crane is mounted on an equalizing structural frame consisting of a trussed portal and four stiff legs. Each leg rests on a 2-wheel truck that is flexible. The motor drive propels the wheels in all four trucks under a frame.

The controller for the hoisting motor is of the magnetic contractor type and gives either power or dynamic braking, as may be required for lowering the empty hook without any shift of the controller handle. Limit switches automatically prevent an overhoist of the load. Limit switches limit the travel of the boom in each direction.

The rotary movement is effected by a 33-hp. crane-type motor geared to a heavy steel gearing bolted to the top of the portal. The motor is equipped with a drum-type controller located in the cab, and a magnetic brake on the armature shaft of the motor automatically stops rotation whenever the power circuit is opened.

The control equipment consists of drum controllers for the travel, and rotating motors and a master controller for the hoist motor. This latter is equipped with an auxiliary interlock providing for operating the hoist engine, for raising the hook, and for lowering the boom.

Electric energy to operate the cranes is delivered to a transformer station at the end of the pier by a 4-wire, 2-phase, 2300-volt, alternating-current circuit. This voltage is stepped down to 188 volts by 105-kv-a. transformers. The 188-volt, alternating current is converted to 250-volt direct current by means of a rotary converter. The current is distributed from the transformer station to the cranes by means of a protected third rail.

The design of the cranes is such as to afford two lifting speeds to expedite the handling of large but light packages. The 10-ton cranes can develop a traversing speed of 150 ft. per min. and a rotating speed of three turns per min. They can develop a lifting speed, on loads of 5 tons or less, of 220 ft. per min., and, of more than 5 tons, of 110 ft. per min. The 20-ton crane can develop a traversing speed of 100 ft. per min. and a rotating speed of two turns per minute. It can develop a lifting speed, of loads of 5 or less tons, of 220 ft. per min., and, of loads of more than 5 tons, of 55 ft. per min.

That the cost of installing the cranes was incurred wisely is indicated by a recent performance of them. A shipment of 50 locomotives for export arrived on 200 cars at Weehawken. The equipment was knocked down in crated packages. Car loads consisted of 20-ton locomotive boilers, 14-ton tenders, 12-ton frames, 4-ton cabs, 4-ton drivers, and 3-ton cylinders. The loaded cars were spotted on the tracks under and beside the cranes and the locomotive parts were picked up and loaded directly into the hold of a ship, having unusually large hatches. During the first day 12 of the 20 boilers were loaded into the ship in 7 hours, a rate of loading from freight car to ship's hold of one boiler per 22-min. interval. The estimated time interval required to load the entire shipment was only 4 days.

PRICES WILL HOLD FIRM SAYS PROFESSOR FISHER.

The present generation probably will see little, if any, reduction in prices because of the inflations in gold and currency, Prof. Irving Fisher of Yale University, one of the country's leading economists, stated at the Washington hearing on the public utilities situation held by a committee of the Chamber of Commerce of the United States. The country's street-railway systems will have to seek relief in directions other than a reduction in cost of labor and materials, he said.

T. S. Holden, of the Department of Labor, declared that building materials were the cheapest commodities on the market today by reason of a less advance in prices of building materials than in the prices of other commodities. Witnesses appearing before the committee asserted that street railways throughout the country were in a critical condition and that, unless relief is given, many more will go into the hands of receivers.

Professor Fisher in his testimony said:

"Business men should face the facts. To talk reverently of 1913-1914 prices is to speak a dead language today. We are on a new high level, which will be found a stubborn reality."

Editorial Comment

A New Prime Mover

A NEW high-efficiency prime mover of British origin has been developed by William Joseph Still in which is combined in one engine the superior thermal cycle at the high temperatures and pressures of the combustion engine with the low thermal cycle of steam to deal with the rejected heat.

The Still engine is capable of using in its main working cylinder any form of liquid or gaseous fuel; it makes recoverable the heat passing through the combustion surfaces as well as the exhaust, for evaporation of steam, resulting in low fuel consumption per horsepower and light weight of engine. Great things are expected of this engine for marine and railroad service because of the lighter weight and lower fuel consumption. For the same brake horsepower, a marine equipment weighs but 80% that of turbine equipment, while for locomotion purposes the efficiency is claimed to be six times as great as that of the present type of locomotive.

Electricity and Electrochemistry

DR. JOSEPH W. RICHARDS' able address at the recent N. E. L. A. convention in Atlantic City on the subject of "The Importance of Electrochemistry" deserves the closest study by every chemist and central-station engineer and manager. This masterful address, appearing on page 988 of this issue, tells in simple language what electrochemistry implies. To those conversant with chemistry, the straightforwardness of Dr. Richards' address will please them; to those pleading only a vague idea of electrochemistry will come a better understanding. In every case the impression is gained that electricity plays a vital part in a great many modern chemical processes.

Electrochemical processes enter into so many industries that every central station should recognize its possibilities as a load builder and for improving the load-factor. The small electroplating plant may meet a need in many places, whereas the extraction of metal from ores may be strictly localized; the melting of brass or steel may be prosecuted successfully in many a foundry where the decomposition of water into oxygen and hydrogen may offer a limited field. Yet all are electrochemical processes required by industry.

For the central station the electrochemical load means a high load-factor, and Dr. Richards points out how the load-factor might often be made higher than is too frequently the case, a fact we would more especially bring to the attention of chemical engineers and the utilities.

The Zoning of Cities

A BILL is being considered by the Illinois Legislature by which a zone sytem of building will be inaugurated throughout the state of Illinois. This bill would enable a municipality or city to specify within what zones of its municipality residences, industrial plants, factories and stores may be erected. In this way, among other things, the promiscuous springing up of factories within residential districts, and the rapid depreciation and disintegration of the latter would be prevented. Cities would grow up homogeneously instead of haphazard as at present.

The zone system of building up a city of any magnitude enables railroad trackage to be laid out conveniently and of a minimum mileage. Shipping of raw materials and finished products can be made without waste of time and energy; power supply can be furnished upon scientific principles and transportation assumes the aspect of something definite to meet a want that can be diagnosed before hand. The zone system safeguards real estate values; it tends to protect the life of the city dwellers and make it pleasanter; offers the opportunity for bulk power supply, and all the advantages that go with it. It is the difference between a settlement that is planned and one that "just grow'd." The zoning of cities movement is one the utilities should stand behind.

Co-ordinating Engineering Standards

CONSIDERABLE development of standards was made necessary during the war in order to facilitate the production of the enormous quantities of munitions needed so urgently for prosecution of the war and also to conserve the supply of raw materials. A great many of the standards that had to be adopted were strictly of an engineering character, so that it was natural to organize an American Engineering Standards Committee, composed of representatives of the leading engineering societies of the country, to deal with the various departments of the Government. This committee served admirably in co-ordinating and harmonizing the conflicting standards formerly existing and offered during the war.

This committee is now to be made permanent and reorganized as the American Engineering Standards Association, the full announcement of this appearing on other pages of this issue. A very useful work is thus to be undertaken that should receive the hearty support of all engineering societies. There are many cases where a standard is set up by one society or interest that may work hardship to another and, while efforts have been made in the past to avoid this, the

new association definitely organized to serve as a common meeting ground for this purpose should act as a stimulus to the development of standards of the greatest and most permanent value. Another feature of great interest is the possibility that the new association may bring about international agreement on engineering standards—a consummation greatly to be hoped for in view of our rapidly expanding foreign trade.

Broad Opportunities for Central-Station Leadership

FEW opportunities like those of the present have ever offered themselves to the electrical industry to develop and expand for meeting the big demands for electrical equipment and electric service that everyone but a confirmed pessimist can see looming up in the not distant future. The call for power and intensified methods of production during the war gave electrical men an opportunity to show that electricity for machinery drive, for lighting, for lightening every form of human labor, and for increasing the comfort of living is nearer to being the universal servant of mankind than any agency ever before was or can now be conceived to be. This prestige that electricity and electric service have won has made a lasting impression so that the call for their aid will be much greater than ever as soon as the remaining hesitancy of the general public will be swept aside. What provision is being made to meet this call for electricity's aid? Is the electrical industry as a whole prepared? What branch of it should take leadership in seeing that the public is adequately and promptly served? These are among the important question of the day for every electrical man to study.

Whether they will publicly admit it or not, there is a general feeling among practically all electrical men that they must look to the central-station branch of the industry to take leadership in the commercial development of the industry as a whole. That is to say, the prosperity of the central stations and their attitude toward development work has a very far-reaching influence on practically all the other branches of the industry and the latter naturally must look to the former with hope for continuance or revival of development. This was well shown in the great interest with which all the proceedings of the recent Atlantic City convention of the National Electric Light Association were watched by related electrical interests and the keenness with which were observed all indications of a policy of general resumption of pre-war activity.

It was fortunate, therefore, that the association showed throughout the convention many evidences of a reawakening of former activities and a hopeful view of the future. Probably the best evidence was the election to the presidency of a splendid type of executive from the prophetic West—the land of big undertakings carried out in a courageous way. Naturally the views and plans of the new president, Mr. R. H. Ballard, of Los Angeles, are therefore of special interest to all electrical men, and we take pleasure in presenting them in this issue in the form of an interview which he granted to one of our editorial staff while stopping at Chicago a few days during his return to his home.

Mr. Ballard impresses one as a very forceful man in the prime of life whose broad experience in the electrical utility field and other branches of electrical activity give weight to his opinions and policies. He has outlined a broad and constructive program for the coming year's work of the association in which every one connected with it can take delight in participating early and whole-heartedly. He feels that the National Electric Light Association has an obligation for active leadership not only in the central-station industry but in the electrical industry as a whole. He aims to bring about an extension of the association's influence throughout the country and to effect co-operation with other electrical interests, the first through development of the geographic sections and the latter through friendly relations with other branches of the electrical industry as they have been carried out so effectively in his own state of California.

A very hopeful outlook is presented throughout the entire interview with Mr. Ballard and a far-sighted plan is disclosed to make the industry not only bestir itself to the possibilities now becoming clear but to prepare for rendering a more comprehensive service to the public than was conceived of as possible a few years ago. Let us all lend a hand so that in his words "Everybody works" for the upbuilding of the greater electrical industry.

Value of Electrical Freight-Handling Equipment on Docks

STEAMSHIP companies and firms engaged in the loading and unloading of vessels of all descriptions are in a particularly good position to appreciate the value of speed and efficiency in this work. Unlike the railroads where the single freight cars are loaded and unloaded at various points and picked up or dropped off at their destinations one at a time, thus keeping the motive power and investment in practically constant operation, in the case of ships the entire investment remains idle during the time in port. And at the same time, the wages of the employes go on just the same.

The concerns engaged in this work along the San Francisco water front have established an enviable reputation for progressiveness and it is not surprising, therefore, that they should be among the first to adopt electrically operated freight-handling equipment. Starting with small installations a comparatively few years ago, the value of such apparatus was quickly realized with the result that at the present time there are several very complete installations in service with

more being added as fast as possible, as described in the article by C. W. Geiger in this issue. Further evidence of the success of this apparatus is shown by the provisions being made by the San Francisco Harbor Board for its use in the piers now in the course of construction.

Another great advantage which the use of electrically operated equipment makes possible is in the efficient utilization of storage space. Property along navigable waterways is very valuable and must be used to its greatest capacity. In addition, the distance over which the freight must be hauled should be kept as short as possible in order to decrease the time required for loading and unloading. The use of portable electric piling machines and conveyors enables heavy materials to be piled on top of each other quickly and with comparative ease, thus relieving congestion and adding to the available space, while by the application of industrial electric trucks and tractors the cargoes are handled with the least amount of effort and the greatest speed.

The Sympathetic Strike

ALTHOUGH things still look threatening, Canada's sympathetic strike appears to be gradually losing ground. Strikers are going back to work and some of the unions have already repudiated the strike or affiliation with the soviet clique. Meanwhile a five-day sympathetic strike in the interests of Tom Mooney is threatened and a general strike of telegraph and telephone operators is more or less under way.

A strike with which public opinion is not in tune never wins. The sympathetic strike is unwise and, because it is unjust, works enormous injury to union labor and the cause of organized labor. The "one big union" jeopardizes the interests of the skilled worker and places the skilled artisan upon a par with the water carrier and the man that pushes the wheelbarrow. A series of sympathetic strikes called by dictatorship of the "one big union" would soon cause complete demoralization of our daily life, the disintegration of our social fabric and rob the worker of his liberty.

That the Canadian strike is losing ground, the manner in which the general strike called in Seattle some months ago fizzled out, and a few more similar instances on a smaller scale elsewhere, show that union labor is not back of this movement of a "one big union" and the soviet form of government. One autocracy is as bad as another, and we have seen both of the extreme types, the one in Germany, the other in Russia. What we want is a rationally balanced form of government of the people, by the people, for the people, and not a "ruling class" appointed by any part of the people. America must remain a democracy if it is to remain a country "fit for heroes to live in." The "one big union" idea has no place in America. We stand for true industrial and social democracy.

Rural Transmission Lines

MUCH attention has been given to the use of electricity for agriculture and on the farm at different times. However, this matter has fallen into the background during the last year or so because of the attention diverted to winning the war. With the coming again of peace, the question of rural lines and electrification of farms will again be taken up. The farmers are credited with having passed through very prosperous times the last three years, and as a result are adopting conveniences that not long ago were looked upon as belonging to the city. The farm-lighting outfit and all that goes with it is claimed to be in big demand, an unprecedented demand.

Now is the time, therefore, for central stations serving agricultural states and rural communities to give serious consideration to the construction of rural lines for supplying this class of load. The farm-lighting outfit and the transmission line each has its place, although the demarkation of each may not always be clearly defined. Co-operation on the part of farmers and rural dwellers and the pooling of interests might easily make the construction of a rural transmission line a financial success and bring electrification to a whole settlement whereas lack of co-operation and harmony would encourage the farm-lighting outfit for a few, without electrification for the less fortunate.

The life of ordinary farm-lighting outfits is not comparable with that of a transmission line. In many communities every installation of the farm-lighting outfit today means financial loss later when the rural line is eventually constructed. Collective bargaining among farmers, advance of initial cost and purchase of utility stock, may all be instrumental for the erection of a transmission line where otherwise such would not be justified.

The better the prospect of high load-factor and energy consumption the more favorable the conditions for the installation of the rural line. The farm-lighting outfit, installed originally for lighting, leads to other things, such as the motor-operated washing machine, sewing machine, the flat iron, fan, and many more similar applications. A farm-lighting outfit may soon be outgrown, but not so with the transmission line. Although the investment required for the latter may be higher than for the former, the investment may be more permanent and bring in greater return.

The farm-lighting outfit and the rural transmission line, each has its sphere; and they do not compete really to any serious extent. There is many a rural transmission line that could be erected with financial success, were the settlers along its proposed route all interested in it and all connected up to it. To what extent this occurs depends very largely upon the vim and enthusiasm with which the local utility tackles the problem.

Week's Events

Many Conventions Meet and Scheduled — Naval Aircraft Radio Described — New Standards Association Formed

ELECTRIC SUPPLY JOBBERS' ASSOCIATION HOLDS BIG SEMI-ANNUAL CONVENTION.

Hot Springs, Va., Scene of Important and Successful Meet.

The semi-annual convention of the Electrical Supply Jobbers' Association held June 10 to 12, inclusive, was undoubtedly one of the largest and probably the most important held by this association. The convention was very largely attended, and the business taken up of the utmost moment to the electrical jobbing business.

The convention opened with the registering of attending members, opening addresses, the transaction of general business and the report of Secretary Overbagh. On the mornings of Tuesday and Wednesday general sessions were held, the final session being held on Thursday afternoon. Lengthy reports by the various standing committees were received, these dealing with the detailed activities of the association during the past busy half year.

It has been claimed that it was co-operation that won the war. One of the most apparent facts brought out at this convention was that co-operation between the Electrical Supply Jobbers' Association and the National Association of Electrical Contractors and Dealers is not only assured, but is a thing existent. The Electrical Supply Jobbers' Association pledged the fullest co-operation with the National Association of Electrical Contractors and Dealers. This action carried with it the official endorsement of the educational work recently undertaken by the National Association of Electrical Contractors and Dealers following the report of the Harmony Committee, presented by W. E. Robertson of Buffalo, N. Y.

The National Association of Electrical Contractors and Dealers appointed a special committee several months ago to be put in charge of the Bureau of Education and Research. This committee consisted of W. Creighton Peet, Peet & Powers, New York City; M. Edwin Arnold, M. E. Arnold & Co., Philadelphia; A. Penn Denton, Economy Electric Construction Co., Kansas City, Mo. As announced later by W. H. Morton, general manager of the Association, the object of the Bureau of Education and Research was to collect from all sources information relative to the best methods of improving and increasing retail distribution, to place this information before the industry and through local effort urge all those now engaged in the retailing of electrical merchandise to increase their efforts and increase their business along efficient and economical lines, and to give retailers the information which they were thought to need to enable them to carry on their business along recognized lines. It was the official endorsement by the Electrical Supply Jobbers' Association of this work by the National Association of Electrical Contractors and Dealers that followed upon the reading of Mr. Robertson's report.

On Tuesday evening W. A. Durgin, lighting assistant to the vice-president, Commonwealth Edison Co., presented his lighting demonstration, "Lighting for Production," before a large gathering. This demonstration was exceptionally well received, holding the attention of the audience from beginning to end. Mr. Durgin was roundly applauded at the close of his display.

Mr. Durgin referred in his introduction to some of the difficulties confronting the lighting man because of the necessity of meeting physiological and psychological conditions that vary considerably in individuals. By approaching the problem of industrial lighting in a human, practical way without overemphasis on illuminating engineering terms, but conforming strictly to the best lighting practice, much headway has been made in Chicago in factory lighting betterment by the central-station organization. Connected to the company's lines are some 700 large industrial concerns with motor installations of 100 hp. or more. During the past year inspectional surveys were made of 260 of these plants that aggregate a floor area of over 19,000,000 sq. ft. and employ 43,000 men. During the hours when work must be performed by artificial light, the average illumination intensity employed in these plants was found to be 1.4 ft-cdl. The equipment in use comprised a varied aggregation of bare lamps and lamps with shades and reflectors of numerous types, mostly cheap in price and misfits, and usually very dirty.

Mr. Durgin discussed the effect of well designed general lighting on reduction of accidents, improvement of supervision, making work rooms more orderly and cheerful, making the men more contented, and other factors that raise the morale of the entire organization. These benefits, while clearly noticed in every properly lighted shop, cannot be definitely reduced to specific figures. The commonly claimed increase of production should be capable of accurate determination, however, and to verify it the Commonwealth Edison Co. instituted a series of carefully conducted tests in four different factories. The results of these were given and showed an energy consumption of 7 and an average illumination 25 times with production increase of 20% normal.

A special model was used for the demonstration, this consisting of a section of a factory about 42 in. wide made to a scale of 1 in. to the foot. A description of this model will be found in the March 1 issue of the ELECTRICAL REVIEW; also the review of Mr. Durgin's talk.

On Wednesday evening a very interesting and enlightening address was presented by Dr. Frank B. Vrooman on "Bolshevism," who surprised many of his listeners with his lucid explanation of what bolshevism really is and how it works.

The Executive Committee has decided to hold the 1920 sprng meeting at Delmonte, Cal.

COOPER HEWITT ELECTRIC CO. ACQUIRED BY GENERAL ELECTRIC.

Well-Known Concern to Be Operated Under New Management—W. A. D. Evans, President.

The General Electric Co. by the acquisition of all the common stock of the Cooper Hewitt Electric Co., of Hoboken, N. J., has secured control of the latter company. In the future, the company will be operated under the regulation and management of the General Electric Co., the following directors assuming office on June 3: C. E. Patterson, comptroller, General Electric Co., New York City; C. W. Stone and N. R. Birge, General Electric Co., Schenectady, N. Y.; G. C. Osborne and W. R. Burrows, Edison Lamp Works of General Electric Co., Harrison, N. J.; L. P. Sawyer and W. H. Roberts, National Lamp Works of General Electric Co., Cleveland, Ohio; Grosvenor Calkins, attorney, Boston, Mass.; W. A. D. Evans, Cooper Hewitt Electric Co., Hoboken, N. J.

W. A. D. Evans, who has been connected with the Cooper Hewitt Electric Co. since its inception, will be in actual charge of the company as president and treasurer. The other officers are: N. R. Birge, vice-president; C. P. Hamilton, assistant treasurer; E. E. Davies, secretary and auditor.

The Cooper Hewitt Electric Co. during the past 16 years has built up a very extensive business in industrial and photographic lighting among the large industrial manufacturers, motion-picture studios, photographers and photographic laboratories. The present policy of the company in its field will be continued and increased facilities will be provided shortly to take care of the rapidly increasing business.

IOWA SECTION, N. E. L. A. TO HOLD AMBITIOUS CONVENTION.

Attractive Program One Feature of Coming Meeting.

The Iowa Section, N. E. L. A., will hold their eighteenth annual convention at Colfax, Ia., June 18 to 20 inclusive. According to circulars sent out by Rex H. Fowler, assistant secretary, the convention will offer an "opportunity to get a four-year course in public utility management in three days."

The tentative program is as follows:

"Rate Litigation in Iowa," by William Chamberlain, general counsel, United Light & Railways Co., Cedar Rapids.

"The Electric Transmission Line and Telephone Interference Situation in Iowa with respect to Farm Line Service," by Howard S. Phelps, electrical engineer, Iowa Railroad Commission.

"Municipal Ownership in Iowa," by John A. Reed, vice-president, Iowa Railway & Light Co., Cedar Rapids.

"The Board of Conciliation—Its Work and Possibilities," by Dean Wm. G. Raymond, State University of Iowa, Iowa City.

"Rates as Affected by the Increased Cost of Production, and the Attitude of Regulatory Bodies Thereto," by X. A. Warfield, rate engineer, Illinois Traction System, Peoria, Illinois.

"Principles to Be Observed in Determining a Rate for Electric Service in Cities Under 5000," by J. B. Hill, professor of Electrical Engineering, Iowa State University, Iowa City.

"The Steam Coal Situation in Iowa and Power Station Economics Applicable Thereto," by F. C. Chambers, electrical and mechanical engineer, Des Moines City Railway Company, Des Moines.

"Electric Service for Farmers" will be presented by five or six speakers.

"Meter Testing for the Small Electric Company," by F. D. Paine, Associate Professor Electrical Engineering, Iowa State College, Ames.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES TO HOLD MEETING.

Summer Section Meetings to Be Held June 16-18 Promises to Be Very Interesting.

The Associated Manufacturers of Electrical Supplies will hold its summer section meeting June 16, 17 and 18 at the Griswold hotel, Eastern Point, New London, Conn. This meeting promises to be particularly interesting and a large attendance is anticipated. Prominent among the important matters to be discussed is the report of the Fuse Section which will include a report on renewable fuses.

A tentative schedule has been drawn up for the various section meetings as follows:

Monday, June 16.—Fuse Section, Outlet Box Section, Industrial and Street Lighting Fixture Section, Air Circuit-Breaker Section, International Trade Committee. A general association meeting for all members will be held Monday evening.

Tuesday, June 17.—Signalling Apparatus Section, Heating Appliance Section, Electrical Porcelain Section, Moulded or Formed Insulation Section, Rigid Conduit Section, Non-Metallic Conduit Section, Armored Conductor and Metallic Flexible Conduit Section, Lamp Receptacle and Socket Section, Attachment Plug Section, Snap Switch Section.

Wednesday, June 18.—Knife Switch Section, Panelboard and Switchboard Section, Line Material Section, Wire and Cable Section.

The exact time for these meetings has not been fixed and, with the exception of the meetings arranged for Monday, this will be considered at the general meeting for all members to be held Monday evening when arrangements as to time will be made to suit the convenience of the members.

It is desirable that all reservations be made through the office of the secretary of the association, Charles E. Dustin, 30 East 42nd street, New York City.

DEVELOPMENT OF NAVAL AIRCRAFT RADIO DESCRIBED.

Institute of Radio Engineers Meets in New York City—Address by T. Johnson, Jr.

At a meeting of the Institute of Radio Engineers held in New York City, June 4, T. Johnson, Jr., formerly associated with the Radio Club of America, at present expert radio aid of the Navy, presented an illustrated lecture entitled "Naval Aircraft Radio." Mr. Johnson rehearsed the early development of aircraft radio communication, beginning with the first operation of radio equipment on an airplane. This operation was conducted by the Navy Department on July 26, 1912, at the Naval Academy, at Annapolis, Md. In that operation, Ensign (now Lieutenant-Commander) Charles H. Maddox, U. S. N., acting as operator on the seaplane, transmitted a message from an elevation of 300 ft. to the torpedo boat, the U. S. S. *Stringham*. The communication was maintained at that time through a distance of three nautical miles.

Early in 1916 a radio aircraft laboratory was estab-

lished by the Navy Department at the United States Naval Air Station, at Pensacola, Fla. On May 15 of that year an official message was transmitted from a naval seaplane in flight through a distance of 20 miles to the U. S. S. *North Carolina*. Several new types of radio outfits were developed by various manufacturers and were tested at Pensacola and at other stations. Types of craft are designated as seaplanes, ship airplanes, flying boats and dirigibles. The arrangement of the wireless apparatus depends to some extent on the type of craft.

After describing the various types of transmitters, receivers and other parts of the radio communicating apparatus, Mr. Johnson described the radio compass and mentioned some of the possibilities to be expected from this apparatus. Five readings taken by the radio compass in flying boats at the Hampton Roads air station in February and March, 1919, on spark signals emitted from the Swan Island station, 1200 nautical miles distant, were in error by only 2°. Bearings with an error of only 1° have been observed at a distance of 300 nautical miles from the Arlington spark signal station.

Nearly the entire development in all radio communication has occurred within two years.

NATIONAL ELECTRICAL CREDIT ASSOCIATION HOLDS ANNUAL MEETING.

Many Interesting and Important Subjects Discussed at Cincinnati Convention of Credit Men.

The 20th annual convention of the National Electrical Credit Association was held June 13 and 14, at the Gibson hotel, Cincinnati, Ohio. Several valuable papers were presented at this meeting and in addition, many topics of interest to electrical credit men and to the industry at large were discussed.

The open session on Friday morning was devoted principally to the reports of the officers and committees of the association including the report of the Board of Managers, the Auditing Committee, the Committee on Contractors' Accounting Methods, the Committee on Association Activities and Committee on Trade Acceptances. This was followed by a luncheon at which W. C. Culkins addressed the members on the subject of public utilities.

In the first part of the afternoon several proposals to amend various sections of the constitution were considered. The latter part of the afternoon was spent at the Fort Mitchell Country Club where a dinner was held for the members in the evening. The principal speaker on this occasions was Ralph A. Tingle.

On Saturday, June 14, a number of interesting and important subjects were on the program for discussion. These topics were as follows: "Trade Acceptance Expenses—Details of Accounting, etc.," in which the discussion was led by Charles W. Dupins, of the Citizens National Bank of Cincinnati; "Consignment Credits and Lamp Agents," led by T. K. Quinn, National Lamp Works of General Electric Co., Cleveland; "Use of Forms—Experiences, Perplexities, Results;" "Moral Risk and Credit Interchange Luncheon Clubs;" "Handling of an Order; Analysis of Credit Information and Decision," led by B. S. Berlin, Heineman Electric Co., Philadelphia, and J. L. Woodford, Doubleday-Hill Electric Co., Pittsburgh; "Following Accounts; Approved Forms of Correspondence in Connection Therewith," L. M. Creighton, Frank H. Stewart Electric Co., Philadelphia, and C. E. Showalter, Iron City Electric Co., Pittsburgh, leaders; "Co-ordination Between Sales and Credit Departments;" "Impressions Gleaned from the 24th Convention of the National Association of Credit Men" led by E. W. Shepard, general credit manager, Western Electric Co., New York.

Following the adjournment of the general meeting the Board of Managers was to meet for the election of officers.

CHEMICAL ENGINEERS TO HOLD CONVENTION JUNE 18-21.

Electric Furnaces Leading Topic to Be Discussed at Semi-Annual Meeting in Boston.

A very interesting program, which will undoubtably attract a very large attendance, has been arranged for the 11th semi-annual meeting of the American Institute of Chemical Engineers to be held at Boston, Mass., June 18 to 21 inclusive. Headquarters of the convention will be at the Hotel Lenox.

Perhaps the most important subject to be presented at this meeting deals with electric furnaces and practically all of the time on Wednesday, June 18, the opening day will be devoted to this subject. Among the papers to be presented on this subject, many of which will be suitably illustrated, are the following: "The Future of the Electric Furnace," by C. T. Bragg, Michigan Smelting and Refining Co., Detroit, Mich.; "Utilization of Electric Brass Furnaces," W. H. Gillette, Bureau of Mines, Washington, D. C.; "Problems Encountered in Electric Furnace Practice," P. E. McKinney, Washington Navy Yard; "Electric Furnaces of the Resistance Type," T. E. Baily, Electric Furnace Co., Alliance, Ohio; "Ajax-Wyatt Induction Furnace," G. H. Clamer, Ajax Metal Co., Philadelphia; "Some Practical Results Secured with High-Frequency Induction Furnaces," Dr. Edwin F. Northrup, Palmer Physical Laboratory, Princeton University; "Booth-Hall Rotating Furnace," Cart H. Booth, Booth-Hall Co., Chicago; "The Rocking Electric Arc Furnace," E. L. Crosby, Detroit Furnace Co., Detroit, Mich. At noon the members will have luncheon at the Engineers' Club and in the evening a smoker will be held at the Arthur D. Little, Inc., Laboratories together with an inspection of the museum and laboratories.

On Thursday an inspection trip will be made by steamer to a number of industries located near Boston harbor, followed by an excursion to Marblehead and dinner at the Eastern Yacht Club. On this trip a paper on "Energy in the Realm of Reconstruction," will be read by Dr. Chester G. Gilbert.

Friday will be spent at the Massachusetts Institute of Technology visiting the laboratories and listening to a program of papers including an illustrated description of the growth and development of the Providence gas plant by W. H. Russell and a symposium on the registration of chemists. The flash and burning points of gasoline-kerosene mixtures will be explained by James T. Robson and James R. Withnow and the manufacture of castor oil in the United States by J. S. Sluader, at this time. During the afternoon the laboratories of Howard university will be visited, followed by an automobile trip through Boston, ending at the Brooklyn Country Club where an informal dinner will be served.

On Saturday an inspection trip will be made to the Pacific Mills, Lawrence, Mass., the largest cloth printing works in the world.

A special entertainment program has been arranged for the ladies, many of whom are expected.

OHIO ELECTRIC LIGHT ASSOCIATION TO HOLD ANNUAL CONVENTION.

Tentative Program Promises Interesting Meeting at Cedar Point July 15, 16, 17 and 18.

The Ohio Electric Light Association will hold its annual convention July 15, 16, 17, and 18 at the Hotel Breakers, Cedar Point, Ohio. According to present indications this will be the largest and best convention ever held by the association, and is expected to make up in pleasure and instruction the losses of the past two years when its activities were greatly restricted on account of the war.

An exceptional program is being arranged. Several speakers of national reputation have already been secured and others are expected to be present. In addition to these the reports of the standing committees promise to be very interesting. A little change will be made in the usual rule this year in that one address and one report will be had at each session, thus giving a variety which is very desirable. The tentative program is as follows:

Tuesday, July 15, first session at 10:00 a. m.: President's address, report of Executive Committee, secretary-treasurer's report, appointment of committees and round table discussion on association work.

Second session, 2:30 p. m.: Report of Station Operating Committee, and a paper, "Daily Unit Data and Cost Systems," by J. M. Strike, Acme Power Co., Toledo, Ohio.

Third session, Wednesday, July 16, 9:30 a. m.: Address by Wm. McClellan, vice-president, Cleveland Electric Illuminating Co.; report of New Business Co-operation Committee, Lighting and Merchandising and Industrial, Power and Heating Sections.

Fourth session, 2:30 p. m.: Address, "The Trend of Socialism," F. G. R. Gordon, Haverhill, Mass.; report of Meter Committee.

Fifth session, 8:45 p. m.: Address and demonstration, "Productive Factory Lighting," Wm. A. Durgin, Chicago; exhibitors' carnival, moving pictures.

Sixth session, Thursday, July 17, 9:30 a. m.: Report of Illumination Committee.

Seventh session, 2:30 p. m.: Report of Transmission and Distribution Committee.

Eighth session, Friday, July 18, 9:30 a. m.: Reports of Finance and Standardization of Voltages Committees and election of officers.

An entertainment program is being drawn up in which special attention will be given the ladies of whom 150 are expected to be present.

A very attractive exhibit will be held in connection with the convention. Only a very few of the 40 exhibit spaces provided have not been engaged and the exhibiting concerns are making every effort to have them as attractive as possible.

AMERICAN ENGINEERING STANDARDS ASSOCIATION BEING FORMED.

Former Standards Committee of Five Societies Reorganizing and Broadening Its Activities in Co-ordinating Standardization Work.

The following statement for publication has been issued by the American Engineering Standards Committee, Comfort A. Adams, chairman, and C. B. Le Page, acting secretary. Headquarters of the committee are in the Engineering Societies building, New York City.

In many lines of engineering much excellent standardization work had been done before the war; the war emphasized its importance and showed most clearly the need of co-operation to prevent the confusion caused by the promulgation of overlapping standards by independent bodies. During the war the government departments co-ordinated these efforts in certain lines and greatly assisted in unifying them. The American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers and American Society for Testing Materials, recognizing the value of what had been done, invited the Government Departments of War, Navy and Commerce to appoint representatives to act with them to continue this work. The body so formed is the American Engineering Standards Committee. It has required considerable time to definitely formulate its objects, and to arrange methods for accomplishing them that would be effective without in any way interfering with the many organizations that have been doing such excellent work in this line.

The American Engineering Standards Committee has just completed and adopted a revision of its constitution which has been sent to the governing boards of all the departments and societies represented on the committee with a request for its ratification.

The new constitution changes the name to American Engineering Standards Association, the change from "Committee" to "Association" more fittingly indicating the wide scope of the interests involved.

The objects of the association are stated as follows:

1. To unify and simplify the methods of arriving at engineering standards, to secure co-operation between various organizations and to prevent duplication of standardization work;

2. To promulgate rules for the development and adoption of standards;

3. To receive and pass upon recommendations for standards submitted as provided in the Rules of Procedure, but not to initiate, define or develop the details of any particular standard;

4. To act as a means of intercommunication between organizations and individuals interested in the problems of standardization;

5. To give an international status to approved American engineering standards;

6. To co-operate with similar organizations in other countries and to promote international standardization.

Means are provided for increasing the number of representatives in the association by invitation or on request. Several important organizations interested in standardization will be invited to appoint representatives as soon as the necessary power is obtained.

The routine work of the association will be conducted by its secretary under the direction of a board of directors. This board will have power to deal with all of the affairs of the association, except the final approval of the standards submitted to it.

Any organizations may request the association to approve standards which it has formulated, or to approve committees that it has appointed, and by so doing becomes a Sponsor Society. Such a request is entirely at the option of the organization that has formulated or expects to formulate the standard. At the request of the sponsor, approval of the standards is given when they are the substantially unanimous conclusions of a committee made up as follows:

(a) Sectional committees dealing with standards of a commercial character (specifications, shop practices, etc.), shall be made up of representatives of producers, consumers and general interests, no one of these interests to form a majority. A producer is a person, or the representative of a firm or corporation, directly concerned in the production of the commodity involved. A consumer is a person, or the representative of a firm or corporation, that uses the commodity involved, but is not directly concerned with its production. General interests include independent engineers, educators, and persons who are neither consumers nor producers, as defined above.

(b) Sectional committees dealing with standards of a scientific or non-commercial character shall consist of persons specially qualified, without regard to their affiliations.

It is anticipated that in nearly all cases the approval of standards and committees by the association will be requested. In case it is considered advisable, the association is authorized to call a meeting of those who would be interested in the formulation of a new standard or the revision of an old one, to select one or more sponsor societies. The sponsor society or societies will appoint a sectional committee to formulate or revise the standard. This sectional committee will report to the sponsor when its work is completed. The sponsor may then request the association to approve. The association deals only with the sponsor and acts only at its request. Provision is made in all publications that a standard must be referred to as that of the sponsor, using whatever title the sponsor has given it, followed by the statement "approved by the American Engineering Standards Association." The approval may be given in one of three ways as—recommended practice, tentative standard, or standard, the expectation being that nothing will be approved as standard until it has shown that it is generally acceptable.

The association thus acts only to bring together those interested in a common object, and when they have completed their work, will at their request certify that it has been done in such a manner as to justify its adoption. Nothing revolutionary is proposed, it is merely an extension of present practice. The Executive Committee of the American Society for Testing Materials now passes on the composition of committees, ascertains that their conclusions are substantially unanimous, and if so, reports them to the society for acceptance or rejection. The association does the same for groups of organizations. Its board of directors performs the same functions as the Executive Committee of the American Society for Testing Materials, and the association as a whole accepts or rejects. It neither selects sponsors nor sectional committees; it does not consider the subject matter of a standard, nor the procedure under which it is arrived at, except that it requires sufficient information from the sponsor to show that the conclusions are substantially unanimous and that the sectional committee is balanced and representative. It requires that in all publications the sponsor shall be given full credit.

In addition to this work in assisting in the selection of committees and certifying that their work has been done under proper conditions, the association will act as a bureau of information regarding standardization. It will collect information regarding existing standards and as to the bodies that have formulated and adopted them. This will enable it to promptly give necessary information to those who select a committee to formulate a new standard or revise an old one. It will also enable it to furnish information desired by the working committees regarding what has been or is being done on similar or related lines. It will establish relations with similar bodies in other countries and can do much to promote the acceptance of international standards. It is possible to secure international acceptance of American standards more easily through such a body than in any other way.

With these fundamental restrictions of its activities it may be asked whether there is sufficient reason for the existence of the association. This naturally has been carefully considered and it is the unanimous conclusion of the committee and of all of those who have been consulted who have been active in standardization work, that such an organization is urgently needed. In the past there have been many occasions when two or more organizations have formulated standards for substantially the same thing. Often these differences have been very slight, but neither has been quite acceptable to the other party. In the majority of such cases if these organizations had been brought together at the start they could have agreed on a standard that would have been satisfactory to both.

The American Engineering Standards Association will furnish a means by which any organization intending to define a standard can readily ascertain what others are interested, and should be consulted in regard to it. At present there is no such means. There is nowhere anything approaching a complete list of the organizations doing standardization work, much less any list of the standards proposed or in preparation. The enormous advantage of having any standard generally accepted, and the much greater probability of accomplishing this if it is prepared under definite conditions that have proved effective in the past, will, it is believed, cause most of the organizations engaged in such work to ask and receive the assistance of the American Engineering Standards Association. It provides definite machinery for securing co-operation and preventing duplication of work. It establishes definite rules securing the absolute autonomy of any group engaged in the development of standards and insures that this group shall receive full credit for its work.

With the assurances of co-operation that the American Engineering Standards Association has already received, we believe that there is no question of the advisability of forming the more broadly representative association. Several organizations have already presented requests for the approval of existing standards and we are informed that many others only await the notification of the committee that it is fully organized.

It has been impossible to make any public statement of the committee's plans until they had been definitely formulated. This, we feel, has now been accomplished and we can therefore state what it is hoped to accomplish and the methods proposed for the purpose.

ORIENTAL ELECTRICAL ENTERPRISE.

Announcement is made of the organization of the China Electricity Co., by the owners of the Sino-Japanese Industrial Co. and the China Industrial Development Association to combine the Japanese firms in China dealing in electrical goods. The new concern will be capitalized at 3,000,000 yen, and it is reported will also lend money in China for telephone and electrical enterprises.

Commercial Practice

Economy of Utility Service — Bell-Ringing Transformer Campaign—Vehicle Applications—Brooklyn Appliance Sale

ECONOMY OF UTILITY SERVICE SHOWN.

Less Than One-Twentieth of Average Income Budgets of Illinois Families Show Goes for Utility Service.

With the high cost of living the uppermost topic in every householder's mind, the Illinois Committee on Public Utility Information has made a careful survey of the state to determine what proportion of the income of the average wage earner—the man earning between $1000 and $2000 a year—goes to the public utility companies in return for the modern conveniences, without which today any community would be paralyzed.

The results of the survey are contained in the following statement:

"The figures show that for electric light, gas for cooking and lighting, telephone and street-car transportation, combined, the average householder spent but 2.60 to 5.26% of his income, the figures dependent upon the locality in which the householder lives. Even combining railroad fares and water bills, the percentage totals less than 6%.

"While not only have wages advanced tremendously and the price of every commodity risen in near-proportion, utility rates do not show such increases, the upturn being practically negligible in comparison with other necessities. Taking the state as a whole, electric rates in 54.3% of all communities are either lower or the same as in 1914, despite the tremendous increase in cost of materials and wages; 64.7% of gas rates are either lower or have not been changed and the same situation applies to 69.2% of all water rates.

"Service at the rates which have been in effect has been a strain on many of the companies and the situation should be corrected. The price of materials of all kinds essential to the operation of these companies has increased from 35 to 300% over the prices prevalent in 1915. Wages of employes have risen on an average of 44% for the state. Fuel, another of the big items to be considered, has advanced nearly 90%.

"The survey shows the average householder in Illinois is now dividing his income in the following proportions, taking the extreme 'top' bills for electricity, gas, telephone and street-car transportation as the basis for computation:

	Per cent of Income.		Per cent of Income.
Food	40.10	Telephone	1.01
Clothes	13.83	Electricity	1.03
Rent, taxes	17.03	Gas, lighting and cooking	1.09
Liberty bonds, other savings, insurance newspapers	17.78	Street cars, self and wife	2.15
Movies, theaters, etc..	5.98		

"The figures show that the increases in cost of operating the utility companies since 1915 has been from 41 to 90%, the average being around 60%. The street railway and gas companies have shown the greater percentage of increase, in the case of the former it being due in large measure to tremendous wage increases granted employes to meet increased living costs."

UTILITY CO-OPERATES WITH LOCAL DEALERS IN CAMPAIGN.

Local Advertising and Window Displays Boost Bell-Ringing Transformers.

The Public Service Co. of Northern Illinois and a number of electrical dealers and contractors are pushing a campaign to encourage the use of the bell-ringing transformer. The benefit is mutual. The utility aims to increase the convenience of electrical devices; the contractors and dealers aim to profit from their installation and sale.

Sick Doorbells
Permanently
Cured in a
Wired House
No trouble with them due to exhausted batteries if you install a
Bell Ringing
Transformer
It will ring your doorbells with the same current that lights your house, and will need no attention.
It is easy to install, will ring three 3-inch bells at the same time, and is low priced.
Public Service Company
OF NORTHERN ILLINOIS

Typical Advertisement Boosting the Bell-Ringing Transformer.

The campaign is being carried on upon a co-operative basis. The utility is advertising in the local weekly papers that serve its territory, the form of advertisement being shown herewith. The electrical dealers and contractors have window displays featuring the bell-ringing transformer, showing the simplicity of the installation, the compact nature of the equipment involved, and its convenience.

By working together in this way greater publicity is obtained than if each party worked alone and at

different times. And then, the advertising by the utility, for which it pays, is equitable, since the dealers would probably not find it profitable to do so because of the small margin of profit, whereas the utility is interested primarily in serving the community and only to a smaller extent in the profit from any sale of the transformers, belts, etc.

CREAMERIES ADOPT ELECTRIC TRUCKS.

Ideal for Wholesale and Retail Distribution of Dairy Products.

Great care must be exercised in the handling of food products, especially if they are to be kept free from contamination—delivered to ultimate consumers clean and pure. Dealers in milk and butter, realizing the necessity of cleanliness in the distribution of their products, have after much study, begun adoption of electric transportation on a large scale.

The Blue Valley Creamery Co., a large manufacturer and distributor of butter, operating in New York, Chicago, Indianapolis, Detroit and St. Louis, have so far installed about 35 electric trucks which, besides proving to be an exemplification of cleanliness, are also proving themselves to be the most efficient, economic and dependable mode of transportation for urban application.

One of the electric commercial vehicle manufacturers has developed a very practical lightweight delivery wagon, extensively being employed by retail milk dealers. This electric truck possesses the feature of external operation by means of a lever located conveniently, which permits the operator to move the "electric" forward and backward under its own power, without necessitating climbing into the vehicle itself, representing a considerable saving in time. In this connection, the electric vehicle competes successfully with the horse trained to move at the command of the driver. Simplicity of electric vehicle operation permits of this innovation which is proving very popular with retail milk dealers. Such vehicle also is cheaper to operate than a single horse wagon, besides being much more dependable.

THE UNITED CIGAR STORES CO. EMPLOYS ELECTRIC TRUCKS.

Used in the Distribution of Tobacco Products from Warehouses to Hundreds of Retail Stores.

The United Cigar Stores Co. started to use electric trucks in New York City in 1917. Since that time they have added to their fleet gradually and are now operating 11 electric commercial vehicles. This nationally known firm states that in their work of distributing from a central warehouse to their chain of stores in New York City they find that electric trucks are costing them about 35% less than gasoline trucks in similar work, and that the "electric" is just as able to cover work of this character as is the gasoline truck.

It is significant that the thousands of electric commercial vehicles are employed chiefly by the largest and most representative business organizations in the country who handle all phases of their business in a scientific manner, rather than leaving results desired to chance. Recognition of the merits of electric transportation by organizations of such caliber is, in itself, conclusive evidence of the superior advantages of this modern system of transportation. To quote the famous slogan of a nationally known manufacturer of flour: "Eventually—Why not now?" Especially, as there is justification in the belief that the ultimate vehicle for urban work will be the "electric."

BROOKLYN EDISON CONTINUING SEASONABLE APPLIANCE SALES.

May Campaign for Electric Vibrators Proves Very Successful—Electric Sewing Machine June Feature.

During the month of May, the Brooklyn Edison Co., Brooklyn, N. Y., conducted a special campaign among its consumers for the sale of electric vibrators. A return postcard, describing the vibrators which were featured during the sale, was inclosed with each electric light bill, and the results obtained were beyond all expectations. It is the usual practice of the company to advertise its special sales in the Brooklyn newspapers every few days, but this year the sale progressed so satisfactorily that the factory was unable to deliver vibrators fast enough to supply the demand and intensive advertising through the newspapers seemed unnecessary.

The number of orders taken was 531, against 425 during the corresponding sale of 1918. When it is taken into consideration that during the latter part of the month no particular effort was made to push the sale, and that the 1918 sale was beaten by 25%, it seems evident that the popularity of the electric vibrator for home use is growing beyond the usual anticipation.

During this month, June, the company is offering as a special sale feature, electric sewing machines. Cards similar to those used in the vibrator campaign, describing the many advantages of the electric sewing machine with a return card attached are being inclosed with its bills.

INTERCHANGE OF ENERGY BETWEEN PENNSYLVANIA CENTRAL STATIONS.

The Metropolitan Edison Co., of Reading, Pa., has signed a contract for an exchange of current with the York Haven Water & Power Co., at York Haven, Pa. The latter company gives service to the town of York and surrounding territory and furnishes wholesale current to the city of Harrisburg. It also supplies the large steel plant at Steelton.

This new contract of the Metropolitan Edison Co. probably will enable the company to dispose of a large amount of current to the water-power plant as the latter is completely up to its capacity and either must purchase current from some outside source for all future growth or else develop a new plant. The York Haven company also must have some source of current for periods when the river water is low and the water plant cannot be used to full capacity.

GARY CENTRAL STATION SHOWS RE-

The property holdings of the Gary Heat, Light & Water Co., Gary, Ind., were recently assessed by the Indiana Tax Board at $3,300,000. Considering the fact that Gary is only 12 years old, the accomplishments of the company are regarded as highly satisfactory to the stockholders, the public and the Indiana Public Service Commission.

The company controls 45 miles of gas mains, 80 miles of water mains and about 100 miles of electric transmission lines for light and power. It has 7000 gas meters, 9000 electric meters and 6000 water meters in service. The electric department of the company has 4000 poles and 400 transformers.

Operating Practice

Relocated Transformer Mounting — School for Cable Splicers Reduces Cable Failures—Low-Cost Insulator Tests

ADVANTAGEOUS RELOCATION OF TRANSFORMER BANK.

Merchants Heat & Light Co.'s Line Construction for Transformer Mountings.

It is the policy of the Merchants Heat & Light Co., Indianapolis, Ind., to locate its transforming equipment and substations so they will interfere as little as possible on the consumers' premises and still be of modern construction and requirements. The following description of changes on consumers' premises is a typical example:

All power as used in the two large plants of the Link Belt Co. is supplied by the Merchants Heat & Light Co., of Indianapolis.

Due to the expansion of the consumers' plant, it was recently found necessary to relocate a bank of transformers supplying part of one factory, known as the Dodge Works, to make more accessible a valuable yard space.

The old transformer installation was of the usual pole type construction having two line poles for dead-ending the line wires and supporting the primary and secondary buses, together with two short stub poles for supporting the wooden platform upon which the transformers were mounted. As now installed the transformers are more readily accessible, less secondary copper is required to reach the consumer's outlet, a neater and better installation has been secured, together with the vacating of a valuable space of yard and driveway, in addition to locating the bank in a space where there is remote possibility of disturbance due to plant expansion.

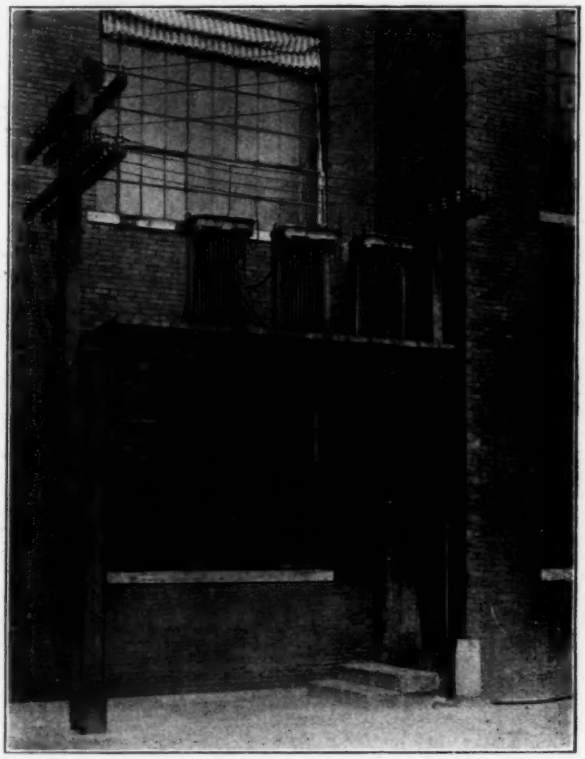
In contrast with the old installations only one supporting member of the structure has a ground footing, where formerly four poles were set and guyed. The vertical supporting member is made up of two 13¼-lb., 9-in. ship channels, spaced 18 in. apart, set well down in concrete, cross braced with ¾ by 12-in. steel plates and also braced against the building wall by one 4-in., 7½-lb. I-beam. The cross members to which the 2 by 12-in. platform material is bolted are made up of two 8-in., 25-lb. channels spaced 18 in. apart, one end of which rests on the vertical member, the other extending 18 in. into one corner of the building wall, allowing a clearance of 14 ft. from transformer base to ground.

Due to the method of line entrance, it was found necessary to erect 4 by 4-in. timbers for dead-ending the primary line. These timbers also support the primary fuses, transformer choke coils and primary bus structure.

At present three 75-kv-a., 60-cycle, 220-volt primary, 110/220-volt secondary transformers are installed, connected star (primary), delta (secondary). The weight of each transformer is approximately 2200 lb., including the 70 gal. of transil oil which each unit contains.

Another bank of transformers, of the same rating, supplying other parts of the Dodge Works, are similarly mounted in one corner of the building, thus allowing the use of all ground space entirely up to the building walls.

The steel structure was designed and erected under supervision of Mr. Praed, works engineer, Dodge Works of Link Belt Co., and approved by the power company's engineering department.



Interesting Transformer Mounting Employed by Merchants Heat & Light Company for Relocating Transformer Bank.

Ample safety factors have been allowed to take care of additional power in case larger and heavier transformers are found necessary at a future date.

LOW-HUNG TRUCK FOR TRANSPORTING LARGE TRANSFORMERS.

Features of Special Low Truck Used by Cleveland Electric Illuminating Co.

In the transportation of heavy and large apparatus through the streets of cities the low head room underneath bridges, etc., often constitutes the greatest difficulty and may necessitate long detours because of inability to pass underneath the overhead structure. The way in which this difficulty can be often avoided

is to employ a low-hung truck, so that the apparatus moves as close to the surface of the road as permissible.

The Cleveland Electric Illuminating Co. possesses a number of large three-phase, oil-cooled transformers, having considerable height, and to permit transporting these along the streets of Cleveland necessitated designing a special truck where the head room required would be a minimum and where the transformers could be handled with a maximum of safety and minimum of work. The type of truck employed is shown in the accompanying illustration.

Low-Hung Truck Used by Cleveland Electric Illuminating Company for Transporting Heavy and Tall Equipment.

The truck shown is mounted upon solid rubber tires and has a capacity of 10 tons. The frame is hung low. The transformer shown has a height of 135 in. to top of cover and is a 750-kv-a., single-phase, 23,000/11,500-volt unit. The truck is provided with a special winch for hoisting the transformer aboard the truck and anchoring it in place.

The company also uses this truck for carrying cable reels, for which purpose it is particularly convenient because of its being hung low. As many as four reels can be carried at one time, the weight of this load being in the neighborhood of 12 tons. From the truck each reel can be easily handled, and handling is reduced to a minimum.

SCHOOL FOR CABLE SPLICERS REDUCES BREAKDOWNS.

Experience of Detroit Edison Co. with Splicers and Splices.

Up to about two years ago, the number of cable failures of the underground cables of the Detroit Edison Co. were comparatively few. Then breakdowns began to multiply and the company set out to investigate the cause. There were some 273 miles of underground 24,000-volt conductor and 4500 joints involved. The conclusion reached was that the cause of the trouble was, primarily, due to poorly made splices.

As the company's underground transmission system grew, additional cable splicers were taken on, and while all the old splicers were capable men, and many of the newer ones also, it happened that the good men were not necessarily able to teach their methods to the newer men with the result that splices of inferior workmanship multiplied, and with them cable failures. A school was then established and the cable splicers were put through routine instructions periodically and finally routine examinations. This was about March, 1917, at which time it was commenced to make joints according to special specifications which were gotten up. Since that time more than 1515 joints have been installed. Of those 1515, there were two joints that failed, being one-tenth of 1%, which amounts to about 2.2 miles of cable.

These specifications first drawn up included the use of paraffine for filling compound, because at that time the company still believed there was nothing better than paraffine. It had no reason to suspect paraffine or feel that it was directly responsible for the cable failures so at that time the paraffine was included in the new type.

It is the opinion of the Detroit Edison Co. that joints made up with paraffine make good joints if extreme care is used in making up the joints, but if the splicer is going to be careless in making up a loose joint, paraffine will not do, and in that respect the compound came to our rescue.

The company has made a number of tests with paraffine and it was found that, in spite of the fact that the dielectric strength showed with new paraffine of a melting point of somewhere around 150° F., the paraffine as taken from the joint as made up did not show the same test in respect to dielectric strength. Another objectionable feature found in paraffine was the large coefficient of contraction. A number of joints were opened and large voids were found, particularly right on the interior, between the three conductors, where it had been expected to find the compound air pockets were found, tending to indicate that paraffine is less satisfactory than compound for cable splices.

Because of the relatively large number of failures the company is continuing to remake many of the splices made previous to 1917. The cable records are referred to and those splices made by splicers whose work has been found to be uncertain are being remade. In all such instances compound replaces the paraffine. Up to the present time 335 joints have been drained of paraffine and refilled with compound. Not one joint made with compound has as yet failed.

TESTING INSULATORS ON LINE AT TWO AND ONE-HALF CENTS EACH.

Georgia Railway & Light Co. Makes Good Record on 27,500 Insulators.

A complete test of the whole Tallulah 110,000-volt power tower line, both north and south circuits, undertaken March 13 and completed May 17, included the testing of 27,550 insulators at a cost per insulator of 2½ cents. The records kept of this test are more complete and detailed than of any other yet made, and the company feels that it has established a model upon which all later tests can be based.

The whole cost of the investigation was $688.74. Of 13,174 insulators of one make, 4120 were found defective, the percentage being 31.3. These insulators are part of the original installation on the Tallulah system and all are on the straight line. Of the remaining 14,376 insulators of another type, on straight and strain lines, only two were found bad, this percentage being .014. The insulators of this make have been in use less than two years.

Replacement of all the insulators that were found defective already has begun, and in this way the company will anticipate and avoid the interruption in service which their later breaking-down would have caused in the course of the stormy season now about to begin.

Contracting-Construction

Illinois Contractors to Meet — English Contracting Problems—Approved Fixture Wires—New Chicago Association

ILLINOIS ELECTRICAL CONTRACTORS TO HOLD MID-SUMMER CONVENTION.

Question of Seceding from National Organization to Be Principal Topic of Discussion.

The Illinois State Association of Electrical Contractors and Dealers will hold its mid-summer convention at the Orlando hotel, Decatur, Ill., June 20 and 21. At this meeting several very important questions will be brought up and promise to make this convention an interesting one.

Perhaps the most important of these problems has to do with the relationship of the state and the national associations. A number of the members are of the opinion that greater progress could be made if the greater expense incurred by membership in the national body could be eliminated. For this reason they strongly urge that the Illinois state association secede from the National Association of Electrical Contractors and Dealers. This is a very vital question and one which promises to bring out a great deal of discussion and a full attendance is very desirable.

Reservations may be made by applying to J. W. Collins, 179 West Washington street, Chicago.

ENGLISH CONTRACTORS MEET SAME PROBLEMS AS AMERICAN.

Recent Article Shows Similarity in Ethical Contracting Problems of Both Countries.

It is often a source of satisfaction as well as encouragement to those having problems to solve if they realize that others in similar positions are confronted with similar problems. For this reason it may be of interest to electrical contractors in this country to know that the contractors in England encounter difficulties in many respects identical to those which confront American contractors. Practically the only difference in the contracting problems of the two countries is that English central-station companies do not take any part in construction or sales work but apparently the activities of the English jobbers, or factors as they are called, more than offset the central-station inactivity. The problems confronting the English contractors are very well described in a recent article in *Electrical Review* of London by Donald Smeaton Munro. This article is substantially as follows.

In these days of the settlement of frontiers it should not be impossible to define a just boundary between the spheres of the electrical contractor and of the manufacturer with his selling agencies and factors.

This is an old grievance, for it is a long time since the contracting frontier was violated by the wholesale men. At times a better feeling prevailed, but there are ominous signs of a renewal of hostilities.

If the contractor be merely an injurious middleman, there is no more to be said. Contractors, however, claim that they did great service not only when the foundations of the electrical industry were being laid, but in building up its structure. Most of them are men of experience, and many have had excellent technical training. This great body constitutes an ideal selling agency, in local and daily touch with the needs and fancies of the purchasing public. Yet, if some of the wholesale people had their way, the contractor's domain would be reduced slice by slice until its occupants became a group of petty wiremen struggling for a livelihood with the inferior class of plumbers, ironmongers, etc. Were this policy to continue, the final result would be an unexpected disaster to the wholesale trade. It is a poor invasion which cannot find some justification and it may not be irrelevant to consider a few of the pleas advanced by the manufacturers and factors.

1. The members of the Manufacturers' Factors, Ltd. (which is the supply jobbers' association of England) find that their accounts are more surely and quickly met by many consumers than by the average contractor. The reply to this is that the financial struggle of the contractor is mainly due to this very invasion. You cannot annex the richest fields without impoverishing those who lose them. To a certain extent, however, contractors finance the factors because many consumers do not pay for their installations until long after the contractor has paid for the goods.

2. The factors would like to save all, or part, of the contractors' profit margin. It would be easy to show that this hope is a fallacy. It is, however, unfair to contractors who hold stocks, employ skilled labor, and do good work for their discounts, and their extinction would result in a vast increase in selling cost and much less selling efficiency.

3. Some contractors are supposed to favor cheap foreign goods. If this were so in the old days, it will not be so in future because of the healthy change in public feeling about home manufactures—unless the contractors are driven to buy goods made abroad for the purpose of repelling factor's trespasses. The contractor has to live by his local reputation and his selection of articles to sell is a protection to the consumer against the plausible tongue of the casual commercial traveller. It was the foreign manufacturer and his local agents, however, who began the invasion complained of.

4. The factors go to the expense of sending out salesmen, ostensibly to the trade. If any one contractor does not buy their goods, why shouldn't the salesman sell direct to the important customers of that contractor?

No contractor can buy everybody's goods all the time. Neither can a factor expect to receive orders from all the contractors of a district, but should be content with his share of business. The only way to meet this is for all the contractors to combine against the factor who pursues this policy. If the Manufacturer's Factors, Ltd., desires to cultivate the retail

trade no one can hinder it, but it would be unreasonable to expect any assistance from contractors. Furthermore, in many cases there would be no harvest to reap if contractors had not prepared the soil and sown the seed.

5. The factors find it useful to establish local agencies. They may expend much money on these on handsome showrooms, extensive stocks and shop window show. Why should they not sell to the public so long as they charge retail prices? Against this it may be urged that they would not so readily find it profitable to do so if they were not subsidized by the orders from contractors. This also gives them an unfair advantage for, in the course of the legitimate wholesale business, they become acquainted with the names and needs of the contractor's retail customers.

6. The Manufacturer's Factors, Ltd., have graciously agreed to sell only to people who have an electrical staff. Even if this arrangement were rigidly adhered to by the local agencies, its value is reduced to the vanishing point by the adopted definition of the phrase "an electrical staff." There are now few works or warehouses or clubs or hotels, etc., which do not have at least an elevator attendant or fuse-replacing porter who calls himself an electrician. The factors who do not wish to play the game consider this quite sufficient for their purpose. Thus whenever contractors develop a town sufficiently they may have to carry on their trade against the competition of the factor's salesmen. First their profits are cut down, then all their good customers are lost, then the factors are angry because a contractor does not send them good orders and pay promptly.

To meet the questions raised by No. 6 the contractors should press unitedly for a fairer definition of an electrical staff. What is really wanted is to exclude the consumer from traffic with the factors. This is done in nearly all other respectable trades; why not in the electrical industry? And a large consumer should not be bribed to become a nominal contractor merely to secure trade terms for his own requirements.

7. Not only every plumber, but every ironmonger, optician, store and fancy goods shop is sedulously cultivated by the factors lest there should yet remain a small field for the business of the retail electrician. In view of the modern growth of the multiple department business it is not so easy to suggest a remedy for this. A remedy can be found, however, if a sense of fair dealing prevails.

It would not be difficult to name further points of conflict, but those given may suffice. The electrical contractors, maintaining useful local businesses with their own capital, skill and personal effort, are like the infantry in the line. They are essential to the successful advance of the electrical industry. There is little wisdom in turning all the heavy ordnance, tanks and airplanes of the electrical army into instruments for the decimation of their own infantry.

The desire of the author of this article is to see a united industry with all sections working together, each in its own sphere, for the triumphant progress of applied electricity.

FIXTURE WIRE FOR ALL TYPES OF LAMPS.

V. H. Tousley, chief electrical inspector of Chicago, in an open letter recently called to the attention of contractors the fact that there are several wires now approved by the Underwriters' Laboratories for the wiring of fixtures in which will be used either the ordinary type "B" tungsten lamps or the gas-filled type "C" lamp. Where wire of this type is used for the wiring of fixtures and where the sockets are of the type approved for use with gas-filled lamps, no change will be necessary in the fixture construction to allow the use of gas-filled lamps.

Wires referred to are now manufactured by the D. & W. Fuse Co., this wire being known as the Deltabeston wire, and a similar wire manufactured by the Independent Lamp & Wire Co., of New York. It is understood that other wires of the same type are being put on the market.

SOUTH SIDE CHICAGO CONTRACTORS FORM NEW ASSOCIATION.

Masters' Electrical Association Organized to Improve Local Conditions and Co-operate with Other Associations.

The Masters' Electrical Association was recently organized by a number of electrical contractors and dealers located on the south side of the city of Chicago. The purpose of the association is to assist its members in every way in the solution of their problems and to improve contracting conditions in that section. The growth of the organization thus far has been very rapid, more than 25 members having already been secured.

Among the first problems which this organization is considering is the matter of contractors' licenses. Although at present there is a city law requiring all contractors to be licensed, it is not deemed sufficient owing to the ease with which the licenses are obtained. As a result, many wiremen now hold contractors' licenses although working for others, and the members claim a considerable quantity of work is lost in this way. Steps have already been taken to remedy this condition by the city authorities and the Chicago Electrical Contractors' Association with whom the new association expects to co-operate. In addition to its activities along these lines the Association intends to carry on an educational campaign among its members to secure better and more complete wiring installations.

Although the Association was formed primarily for the purpose of solving local problems, it is the intention to co-operate as closely as possible with any other Chicago associations or with state and national associations in any work which tends to better the industry. Some of its members are already members of the larger associations and many others have signified their intention to become members of these organizations.

The following officers have been elected: Albert Wagner, president; A. Oppenheimer, vice-president; S. M. Kahn, treasurer; and H. E. Entler, 135 East 51st street, is secretary.

This is the third sectional organization of electrical contractors to be formed in Chicago, the two former being the Commercial Electrical Association, composed principally of contractors located on the west side of the city, and the Chicago Electrical Contractors' Association, which includes the larger contractors located in all parts of the city. Another association composed of north side contractors is also contemplated. It is expected that these associations working individually on purely local problems, and in co-operation with each other on the larger ones, will do a great deal toward improving contracting conditions in Chicago, and the world knows they need it.

New Appliances

Combined Washing and Drying Machine—Electric Meters for Measuring Gas-Plant Output—Ammeter for Automobile

Marlow Combination Electric Washer and Dryer.

Commercial laundries, as well as the laundries of large clubs, hotels and institutions, use such methods for washing and drying clothes as have been found by experience to be most economical from every standpoint. The washing is done in large cylinder machines and the water is removed by extraction instead of wringing. Use of wringers involves handling each individual piece and feeding it into the wringer properly, and besides results very commonly in tearing off of buttons and ripping or otherwise damaging the clothes because of the violent strain of passing between the rolls. If the wringing rolls are not set tightly the danger of damage is diminished, but the water is only imperfectly removed. For these reasons the wringer that is so common a part of household laundry equipment was long ago banished from the large laundries.

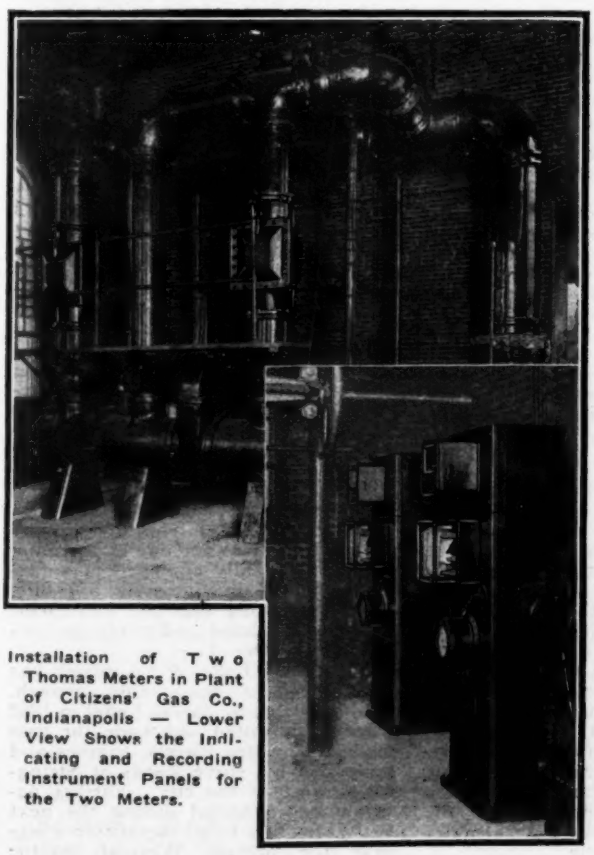
In developing an electric washing machine for household use, it occurred to the designers of the Marlow Manufacturing Co., 2152-60 Superior avenue, Cleveland, Ohio, to use the extractor principle in place of the wringer in order to obtain a close approach to the efficiency of large laundries. The Marlow washing machine carries out this idea. The washing is done in the large motor-driven cylinder, which has a capacity of 12 sheets or their equivalent and makes 35 r.p.m. Removal of the water is secured by throwing a batch of the washed clothes into the extractor. This extractor can be run while another batch is being washed, or it may be run separately. In either case its speed is about 1500 r.p.m., which produces such a powerful centrifugal action as to throw out practically all the water in 3 to 5 minutes, leaving the clothes just damp enough to iron effectively without further drying and remoistening.

This machine is built substantially of metal throughout. Most of the surface is porcelain-enameled to make keeping the machine clean an easy matter. So well balanced is the extractor that its high speed does not make the machine vibrate seriously or move on its casters. The motor is well protected and the mechanism guarded.

Thomas Electric Meters Measuring the Output of a Gas Works.

The Citizens Gas Co., Indianapolis, Ind., has completed the installation of two Thomas meters in its Langsdale avenue plant. The equipment and piping arrangement is interesting because it permits the use of either of the two meters to measure the gas load while the other is held in reserve, or the two meters may be thrown in series, each measuring the same gas and checking each other's accuracy. When peak load occurs or when unusually heavy demands make larger capacity necessary, the two meters may be operated in parallel. The gas company is therefore assured of uninterrupted gas measurement, means for checking accuracy of meters and capacity for properly measuring the gas flow over a range varying from the minimum capacity of one meter to the maximum of two.

Accompanying illustrations show the two meter housings and the instrument panels which contain the totalizing and graphic meters. The meters measure the coke-oven gas obtained from one battery of 43 Semet-Solvay ovens. The housings and panels are located in a part of the office building which was formerly occupied by a 16-ft. drum station meter. The housings are each 16 in. in diameter and are inserted in a 24-in. line between the purifiers and the storage holder. Each meter is of 200,000 cu. ft. per hour capacity, which is sufficient to handle the coke-oven gas load. The pressure drop through the entire installation is less than ½ in. of water with 200,000 cu. ft. of gas per hour. A platform built around the housing makes easy inspection of the parts of the meters which are contained within the housings.



Installation of Two Thomas Meters in Plant of Citizens' Gas Co., Indianapolis — Lower View Shows the Indicating and Recording Instrument Panels for the Two Meters.

Ammeter for Universal Use With Lighting and Starting Systems of Automobiles.

A new type of direct-current ammeter for use with electric lighting and starting systems of automobiles has been placed on the market by the Roller-Smith Co., 233 Broadway, New York City. The outstanding feature of this instrument is its universal application to all makes of cars, all makes and types of lighting and starting systems and all voltage systems. With all the different makes of cars on the market and all the different types and voltages of systems with which they are equipped, it is a very difficult matter for a jobber, dealer, service station or garage to recommend a suitable ammeter to a car owner who is in need of a device of that kind, the principal point being that the ordinary ammeter which is designed for lighting circuit work will not operate under conditions where the ammeter must be installed in the cranking circuit, such, for instance, on some cars where the single-unit, single-wire type of system is employed. With the new Roller-Smith "Universal" ammeter it does not make any difference what make and type of car and system it is installed, as this instrument will operate satisfactorily under any conditions, it having been particularly designed for cranking-circuit use. This is the only ammeter on the market of which this may be said.

Trade Activities

James Leffel & Co. Acquires New Factory Site—Milliken Manufacturing Syndicate to Handle European Business

Ilg Electric Ventilating Co., Chicago, manufacturer of fans and blowers will erect a new factory building at the southwest corner of Crawford avenue and George street, on a tract of land approximating ten acres, on the Chicago, Milwaukee & St. Paul railway. An issue of $400,000 of the company's first mortgage 6% bonds has been underwritten by S. W. Straus & Co. to finance the new plant.

Standard Electric Co., Seattle, Wash., has moved from a former location to 2931 First Ave., South, where larger shop room and warehouse floor are available. The two men active in the concern are Herbert C. Moss and Percy S. Martin, the latter having recently purchased an interest in the business, which consists in electrical construction and repairing.

The Baker R. & L. Co., Cleveland, Ohio, manufacturer of industrial electric trucks and tractors, has issued a pamphlet entitled "Features," which describes in a general way the several models of trucks and tractors, which with an engineering service comprise the Baker system of industrial transportation. The mechanical construction of this equipment is described in detail, and numerous illustrations included, showing typical installations of Baker trucks and tractors.

Westinghouse Electric & Manufacturing Co. recently held a memorial in its East Pittsburgh works in honor of former employes of the company who paid the supreme sacrifice in the world war. A chorus comprising about 65 voices opened the service by singing "Lead Kindly Light," after which a large silk service flag was lowered containing the gold service star and the number of its employes who have died, numbering 72 out of 8000 employes who answered the call to arms. A memorial address was delivered by A. L. Ashby, attorney for the company.

The Seattle Electrical Supply Co., lately incorporated at Seattle by M. V. Underwood, H. B. Sawyer and E. A. Norton, has opened a new store at 509 Pine street, that city, for merchandising electrical appliances, with special reference to the needs of the electrically equipped home and household. The quarters of the company are being fitted and equipped in attractive and modern fashion. Mr. Underwood was formerly with Miller & Sons; Mr. Sawyer, until recently, was manager of the appliance department of the Puget Sound Traction, Light & Power Co., and Mr. Norton was formerly connected with the sales department of the Pacific States Electric Co., at Seattle.

Electric Furnace Co., Alliance, Ohio, has just shipped one of its standard nose-tilting type furnaces to the United States Navy Yard at Washington, D. C., to be used in the Government brass foundry there. This furnace is provided with a motor-operated tilting machanism and has a maximum hearth capacity of 2000 lb. The shell is 7 in. in diameter, and the furnace is rated at 105 kw. in electrical capacity.

The De Laval Separator Co., 165 Broadway, New York, the world's largest maker of centrifugal pumps, has recently issued its Bulletin No. 100 on the subject of "The De Laval Method of Purifying and Reclaiming Oils." This bulletin of 24 pages, is well gotten up and is generously illustrated. The De Laval method of purifying and reclaiming oils is discussed, the application of centrifugal force described and the manner in which by its action oils are purified and reclaimed. Various forms of centrifugal oil purifyers for steam power plants, for reclaiming oils of gas engines, axle waste and Diesel engines and cutting oils are covered. The working of the De Laval centrifugal purifiers and the mechanical construction of each working part is fully explained. The bulletin is an instructive one that ably deals with a worthy subject.

The James Leffel & Co., Springfield, Ohio, manufacturer of water wheels, engines and boilers, in order that it may be provided with adequate facilities for handling its rapidly increasing business, has purchased the property and plant of the Columbia Planter Co., on East street. This includes all of the adjoining property north to the D. T. & I. Railroad tracks and south 100 ft. from the Fairbanks estate, constituting a new factory site, extending 1432 ft. in length and comprising between nine and ten acres of ground. The Leffel company purposes to immediately commence work on the erection of a new plant that will contain the latest improved machinery, equipment and sanitary features. Engineers and architects are already engaged on plans for one of the most modern and fully equipped manufacturing plants in the state of Ohio, and it is hoped that the new plant will be completed and ready for occupancy by Dec. 1.

The James Leffel & Co. which has experienced a remarkable growth, was organized by James Leffel in 1862 when he invented and made the first models of water wheels, engines and boilers in his stove works at Springtown, west of the city. Further development occurred during the next two years in a small factory on a site near the present Westcott motor works. In 1864 Mr. Leffel purchased a planing mill utilizing Mill Run for testing purposes, and soon after added the property subsequently known as the Columbia theater. Associated with Mr. Leffel were John and William Foos and James Goode, but in 1866 the company was reorganized when the late Hon. John W. Bookwalter purchased the interests of John Foos and James Goode. The business continued there until 1879, when new shops were built, and later expanded at the present location on Lagonda avenue and Nelson street. In the meantime Mr. Bookwalter had purchased the interest of all his associates and became sole owner and proprietor, having brought into the business in 1887 his brother, F. M. Bookwalter, who in seven years became the active manager, continuing with the business until retiring in 1917. It was largely due to the latter's untiring and intelligent management that the production of the company enjoys its well earned reputation.

In 1890 the business was incorporated as The James Leffel & Co., and from that time it has expanded to the extent that enlarged manufacturing facilities have become a necessity. A. F. Sparks, for the past several years vice president and general manager, is one of the best recognized hydraulic engineers in the country. Besides George R. Prout, president, the other officers who have been identified with the business for many years are: A. F. Sparks, vice president and general manager; A. L. Baylor, secretary; B. F. Kauffman, treasurer, and E. J. Sanderson, sales manager.

Milliken Brothers Manufacturing Co., Inc., Woolworth building, New York, has organized the Milliken Manufacturing Syndicate, Ltd., London, England, to handle all European business for the well-known electric transmission towers, radio towers, pinlock poles, and Milliken buildings. These different steel specialties have enjoyed a large export trade. The English organization will be associated with the Widnes Foundry Co., Ltd., Widnes, Lancashire, where facilities will be provided for manufacturing these products for English trade, the British colonies, and other countries. C. T. Wilkinson, formerly London representative for Milliken Brothers, Inc., and F. Sumner-Smith, formerly managing director of the British Electric Equipment Co., Ltd., will be associated with the new organization. To provide for western trade in this country, the company has established a branch office in the Majestic building, Chicago, Ill.; for Pacific Coast trade, offices have been established in the Rialto building, San Francisco, Cal.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Weybridge, Vt.—Plans are being prepared for a one-story, 25x100 ft. hydroelectric plant and two dams for the Hortonia Power Co.

Saugus, Mass.—The City Council, Lynn, has had plans prepared for the construction of a new one-story pumping plant, about 28x40 ft., to be located at Hawkes Pond in the Saugus section. Reeves J. Newsome, City Hall, Lynn, is water commissioner.

New Britain, Conn.—Landers, Frary & Clark, manufacturers of electrical appliances, etc., have awarded a contract for the construction of the proposed one-story brick building, about 50x100 ft., to be located on High street. The Ellison Construction Co., 120 Wellington avenue, Hartford, is the contractor.

New Haven, Conn.—Lapides & Kalison have recently been awarded the contract for electrical work in connection with the erection of a new apartment building at Orange and Bishop streets.

Waterbury, Conn.—American Brass Co., 414 Meadow street, has completed arrangements for the erection of a new one-story power plant at its works, for increased operations. The structure will be about 35x50 ft., and with equipment is estimated to cost approximately $50,000. The H. Kent Co., 141 Broadway, New York, has been awarded the contract for construction.

Providence, R. I.—The W. & J. Electric Co. has filed notice of organization to operate at 631 Public street. Charles H. Wheaton, 30 Fifth street, East Providence, and James A. Jones, Providence, head the company.

Forestport, N. Y.—The Village Trustees, Forestport (Oneida county), have filed application with the Public Service Commission for permission to construct, maintain, and operate a new electric plant, to be used for local and municipal service.

Lancaster, N. Y.—Burdick-Stafford Electric Corp. has filed notice with the Secretary of State of a change in its corporate name to the Burdick Reynders Electric Co., Inc.

Lyons, N. Y.—Announcement has been made by the Niagara, Lockport & Ontario Power Co., Marine Bank building, Buffalo, that operations will be resumed at an early date in its local plant. It is understood that about 300 persons will be employed.

New York, N. Y.—Interborough Rapid Transit Co. has recently inaugurated operations in a large new triplex Westinghouse turbogenerator of 100,000 hp., said to be one of the world's most powerful engines, operated by rotary motion. The control of this turbine is centered at a switchboard located in the upper section of the plant, and the machine is started, stopped, etc., by merely operating a few dozen small keys.

New York, N. Y.—It is understood that the Broadway Association is backing a movement for the installation of increased lighting facilities along Broadway, to include various sections of the thoroughfare.

New York, N. Y.—Crocker National Fire Prevention & Engineering Co., 1270 Broadway, has submitted a low bid on electrical equipment and installation for a new public school building at 180th street and Belmont avenue, to be known as Public School No. 57, at a price of $23,898.

New York, N. Y.—Wappler Electric Co., Inc., 173 East 87th street, manufacturer of batteries, has increased its capital from $750,000 to $850,000, for general expansion. The company has recently acquired property on Harris avenue, Long Island City, for the construction of a proposed manufacturing plant.

New York, N. Y.—New York Edison Co. has recently been awarded a contract for electrical service for the large new nine-story apartment house covering four lots now in course of erection at 115 East 82nd street. The installation totals 2000 lights, and about 75 hp. in motors, the latter equipment to operate two elevators and the complement of house pumps.

Niagara Falls, N. Y.—U. S. Light & Heat Corp., Highland avenue, manufacturer of batteries, lighting equipment, etc., has awarded building contracts for the construction of the proposed addition to its plant on 15th street, to provide for increased operations. The work is estimated to cost $77,000. The John W. Cowper Co., Fidelity Building, Buffalo, is the contractor.

Rochester, N. Y.—North East Electric Co., 348 Whitney street, has had plans prepared for the construction of a new six-story plant, about 61x206 ft., to be used for increased operations. The company specializes in the manufacture of electric starting and lighting systems. H. W. Fowler is superintendent of construction.

Saratoga Springs, N. Y.—Adirondack Electric Power Corp. has filed application with the Public Service Commission for permission to construct extensions to its electric plant and systems in Westmoreland, Verona, Vernon, and Kirkland, Oneida county, to provide for increased operations.

Schenevus, N. Y.—The Board of Village Trustees has recently authorized the issuance of bonds for $22,000 to provide for the cost of the construction of a new electric light plant and transmission system through the town of Maryland to the town of Milford. The board has recently filed application with the Public Service Commission for the necessary permission for the proposed construction work.

Solvay, N. Y.—The Board of Trustees has awarded a contract to F. L. Worth, 430 Center street, Solvay, for the construction of the proposed substation, to be used for municipal service.

Newark, N. J.—Public Service Electric Co. contemplates making extensions to its electric power plant at Point-No-Point to involve an expenditure of about $80,000.

Newark, N. J.—K-W Electric Co., Inc., 49 Lawrence street, has been awarded a contract for the electrical work in connection with the construction of a large new warehouse by the American Oil & Supply Co. on Wilson avenue, at $2150.

Trenton, N. J.—Hutchinson Storage Battery Co., 230 South Warren street, has taken bids for the construction of a two-story reinforced-concrete storage battery plant and administration building, about 36x51 ft., to provide for increased operations.

Allentown, Pa.—Frank Koeski, consulting engineer, has prepared specifications for the proposed electric plant.

Fort Mifflin, Pa.—In connection with the proposed construction of a local T. N. T. plant of the Government, a new boiler plant, about 17x70 ft., with wing, 22x23 ft., will be erected. A melting and cooling building, fusing house, fuse and detonator buildings, finishing plants, and other structures will be erected. The Bureau of Yards and Docks, Navy Department, is in charge of the work.

Grove City, Pa.—Engineer Sidney B. Martin, Pennsylvania building, has prepared estimates for additional unit to the electric light plant. Address L. L. McKay, city manager.

Harrisburg, Pa.—A new establishment has been opened recently by the Diamond Grid Battery Co. at 68 South Cameron street, to engage exclusively on repairs, etc., on the Philadelphia Diamond grid battery. The new station is under the management of L. G. Airsman.

Myerstown, Pa.—The Board of Managers of Albright College is having preliminary plans prepared for the construction of a new electric light and power plant at the institution, to be erected in connection with a number of other structures, the

entire work being estimated to cost approximately $200,000. A. A. Richter and H. I. Eiler, 33 North Sixth street, Reading, are associate architects.

Philadelphia, Pa.—American Insulation Co. has disposed of its three-story factory and four-story manufacturing building at Stokley street and Roberts avenue, to the United States Government for a consideration of about $186,000. These buildings, exclusive of equipment, are assessed at $50,000. The property is adjacent to a tract of about four acres at Roberts avenue and Bristol street purchased by the Government about a year ago, at which time it was proposed to utilize the site for the construction of a new gun manufacturing plant.

York Haven, Pa.—York Haven Water & Power Co. is considering plans for the erection of a one-story concrete machine shop at its local plant. The structure will be about 45x66 ft., and is estimated to cost $25,000. Garrett & Seelye, 204 Locust street, Harrisburg, are architects and engineers.

Hampton Roads, Va.—The Navy Department is taking bids for the construction of a new electric distributing system at the local Government site. The proposed work will cost about $60,000.

Richmond, Va. — Coleman-Miller Electric Co. has recently been organized to manufacture electrical appliances and equipment. James A. Miller, 516 West Grace street, is president.

South Charleston, W. Va.—South Charleston Utilities Co. has recently awarded a contract to the Engineering Service Co., Charleston, for the erection of a new electric light plant and distribution system, estimated to cost $15,000.

Spencer, W. Va.—The city has had plans prepared for the erection of a new one-story brick electric light plant, to be used for municipal service, about 30x40 ft. R. C. Wieland is mayor.

Warwood, W. Va.—Hyglo District Electric Sign Co. will erect an electric sign plant here.

Cornelius, N. C.—The city is considering plans for the installation of a municipal electric light system. Bonds for $6000 will be issued to cover the cost of the proposed work.

Wilmington, N. C.—In connection with the proposed construction of a large new plant by the Morris Fertilizer Co., Third National Bank building, Atlanta, Ga., to be located on the Cape Fear river, near Wilmington, estimated to cost in excess of $400,000, an industrial electric railway of the third rail system will be constructed, power to be furnished by the Tidewater Power Co., Wilmington. The company is also having plans prepared for the erection of a new phosphate mining plant near Bartow, Fla., estimated to cost about $750,000, both of the works to be fully equipped with electrically operated apparatus and mechanical equipment, etc. The installation at the latter plant will comprise four 400-hp. boilers, two 1000-kw. steam turbines; pumping machinery, and auxiliary apparatus, with complete electric power plant aggregating in cost about $50,000.

Greenville, S. C.—Southern Bell Telephone & Telegraph Co. with headquarters in Atlanta, Ga., has awarded contract to Jamison & Morris of this city to remodel telephone building here. About $5000 will be expended.

DATES AHEAD.

Tri-State Water and Light Association. Annual convention, Greenwood, S. C., June 17-19. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

American Society of Mechanical Engineers. Spring meeting, Hotel Statler, Detroit, Mich., June 17-20. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

American Institute of Chemical Engineers. Semi-annual meeting, Boston, Mass., June 18 to 21. Secretary, John C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Association of Municipal Electrical Engineers of Ontario. Annual convention, Niagara Falls, Ont., June 19-21. Secretary, R. A. Clement, 190 University avenue, Toronto, Ont., Can.

Illinois Association of Electrical Contractors and Dealers. Summer convention, Decatur, Ill., June 20-21. Secretary, W. J. Collins, 179 West Washington street, Chicago.

New York State Association of Electrical Contractors and Dealers. Annual convention, Saratoga Springs, June 23-26. Headquarters, Grand Union Hotel. Secretary, J. P. Ryan, 26 Cortland street, New York City.

American Society for Testing Materials. Annual meeting, Atlantic City, N. J., June 24-27. Headquarters, Hotel Traymore. Secretary, University of Pennsylvania.

American Institute of Electrical Engineers. Annual convention, Lake Placid, N. Y., June 24-27. Headquarters, Lake Placid Club. Secretary, F. L. Hutchinson, 33 West 39th street, New York.

Canadian Electrical Association (affiliated with N. E. L. A.). Annual meeting, Alexandria Bay, N. Y., June 27 and 28. Secretary-treasurer, W. Volkman, Toronto Power Co., Toronto, Ont., Can.

National Association of Electrical Contractors and Dealers. Annual convention, Milwaukee, Wis., July 15, 16 and 17. General manager, William H. Morton, 110 West 40th street, New York City.

Ohio Electric Light Association. Annual meeting, Cedar Point, Ohio, July 15-18. Headquarters, Breakers Hotel. Secretary, D. L. Gaskill, Greenville, Ohio.

Michigan Section, N. E. L. A. Annual convention, Ottawa Beach, Mich., Aug. 19-21. Headquarters, Hotel Ottawa. Secretary-treasurer, Herbert Silvester, Monroe, Mich.

Southeastern Section, N. E. L. A. Annual convention, Asheville, N. C., Sept. 17-19. Secretary-treasurer, T. W. Peters, Columbus, Ga.

International Association of Municipal Electricians. Annual convention, Chicago, Sept. 23-26. Secretary, Clarence R. George, Houston, Tex.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., September, 1919. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

National Association of Electrical Inspectors. Annual meeting, Springfield, Mass., Oct. 13 and 14. Secretary, W. L. Smith, Concord, Mass.

Illuminating Engineering Society. Annual convention, Chicago, Ill., October. General secretary, Clarence L. Law, 29 West 39th street, New York City.

Lake City, S. C.—City contemplates water works installation.

Bowling Green, Fla.—Bowling Green Manufacturing Co. has increased its capital from $15,000 to $50,000. Electrical equipment will be purchased. Address W. J. Case, manager.

Bowling Green, Fla.—The city has called a special election on July 1, to vote on the issuance of bonds for $20,000, to cover the cost of the construction of a new electric distributing system and water works.

Dalton, Ga.—Georgia Railway & Power Co. is arranging plans for improvements at its local power station, estimated to cost about $6000.

NORTH CENTRAL STATES.

Dayton, Ohio.—Dayton Power & Light Co. acquired several properties located on the southwest corner of Fourth avenue and Conover street for erecting a new substation. The power company proposes to establish a substation in that section of the city, which has been planned as a part of its ultimate development and is now made necessary by the demands for service in Edgemont, West Side and Dayton View. Definite plans have not yet been made.

Lima, Ohio.—Ohio Electric Co. will expend $200,000 on new equipment and will erect within five years either at Indian Lake or Scotts Crossing, a power plant to cost $2,000,000, capable of handling light and power demands of the city for the next ten years.

Marion, Ohio.—The street lighting committee has been petitioned for additional lighting. Address clerk of the commission.

Northfield, Ohio.—The sum of $35,000 in bonds has been issued for electric light equipment. The current to be furnished by the Northern Ohio Traction & Light Co.

Wellington, Ohio.—$50,000 in bonds has been voted to install lights and power plant. Address town clerk.

Connersville, Ind.—Indiana Public Service Company has issued an order lowering the rates of the Hydro-Electric Light & Power Co. 10%.

Gary, Ind.—Contracts have been let for the erection of a $2,500,000 addition to the Inland Steel Co.'s plant at Indiana Harbor, Ind. A total of 11,000 tons of steel will be used in the construction of the new building which will be used as a rails mill.

Newport, Ind.—Commissioners of Vermilion county have awarded wiring of court house to Henderson & Beach, Evansville, Ind., for $1500.

Peru, Ind.—Lake Erie & Western railroad has plans for the erection of a new powerhouse, mill, machine shops and 10 additional stalls for the newly constructed roundhouse, these improvements to cost $250,000.

Seymour, Ind.—Interstate Public Service Co. will erect a high-tension transmission line from its substation in Greenwood to the hydraulic power station at Williams. A transmission line was recently built from Seymour to Columbus and it was announced at that time that it would be extended from Columbus northward to Greenwood.

South Bend, Ind.—A company to deal in electrical equipment has been formed by E. L. Burch and A. G. Graham of South Bend and Albert Weger of Chicago. A display room will be opened at 123 North Michigan street on July 1. Lalley farm lighting plants will be distributed by the new company, which will operate in 18 northern Indiana counties, as well as in Berrien, Cass and St. Joseph counties in Michigan. A line of other electrical appliances will also be handled.

Athens, Ill.—Athens Electric Light & Power Co. will erect its lines to include Cantrall, Indiana Point and Fancy Prairie.

East Moline, Ill.—Voters will decide whether new sewer pumping station and improvements to cost $25,000 shall be built or not.

East St. Louis, Ill.—The sale of the assets of the Southern Traction Co., announced for June 10, has been postponed until July, the exact date not having been determined yet, as the result of an order entered in the United States District Court at Urbana by Federal Judge English. The order stipulates that the entire purchase price shall be paid in cash. The assets include a single track road from Fourth street and Broadway, in East St. Louis, to Belleville, Ill.

Rock Island, Ill.—Victor Storage Battery Co. will be removed from Moline, Ill., to Rock Island and a $52,000 factory will be erected. The factory will be 80x300 ft., of concrete and brick construction. More than forty men will be employed.

Sherrard, Ill.—A high-tension transmission of 11,000 volts will be built from Coal Valley to Milan by the Sherrard Electric Light Co.

Springfield, Ill.—At the meeting of the City Council a numerously signed petition was presented asking for the installation of an ornamental lighting system in Douglas avenue, between Fayette and Lawrence avenues.

Vienna, Ill.—The council is planning to install an up-to-date power plant. Address city clerk.

Big Rapids, Mich.—Bids will be received June 16 for the installation of an electric lighting plant, for wiring and accessories at the county farm. Address W. B. Lyons, chairman, Big Rapids, Mich.

Ashland, Wis.—The municipal lighting plant burned. Loss $10,000.

Elroy, Wis.—Bids will be received June 22 for the purchase of $10,000 electric light bonds. Address M. P. McGuity, city clerk.

Manitowoc, Wis.—The county will install street lamps in conjunction with street lighting system on South 8th street. Address Adolph E. Schulze, county auditor.

Milwaukee, Wis.—Hackendahl & Schmidt, structural fabricators, will enlarge their plant and have awarded contracts for the erection of a one-story addition, 80x100 ft., to be equipped with a 5-ton electric traveling crane.

Port Washington, Wis.—The City Council is considering the issue of $30,000 in bonds for extending and improving the electric light system. Address city clerk.

Wrightstown, Wis.—S. D. Schooky will erect a three story flour and feed mill. Two electric motors will be installed.

Ely, Minn.—The question of issuing $66,000 light and water bonds will be submitted to vote. Address J. Wisted, Jr., town clerk.

Minneapolis, Minn.—The county commission contemplates installing 100 additional fire alarm boxes, new terminal switchboards and other instruments necessary to meet suggestions of the National Board of Fire Underwriters. Address J. T. Morrison, superintendent of the fire department.

Burlington, Iowa.—A request for a franchise for the installation of electric transmission lines on every public highway in six townships in Des Moines county is asked by the American Utilities Co., a new company to enter the industrial fields of Des Moines county. It is planned by the company to erect lines along these roads and furnish electrical energy for lighting, heat and power to the residents of towns or rural communities in the following townships of the county: Augusta, Concordia, Danville, Pleasant Grove, Washington and Yellow Springs.

Centerville, Iowa.—Iowa Southern Utilities Co. will rebuild and remodel its power house. The company will also ballast seven miles of interurban track. Address J. A. Johnson, general manager, Centerville, Iowa.

Davenport, Iowa.—A movement is under way for the construction of an electric railway from the tri-cities of Davenport, Rock Island, Moline, to the southern end of Illinois at Metropolis, by way of Springfield. The Davenport, Springfield & Southern Railway Co., organized for this purpose, has begun surveys for a heavy electric railroad between Davenport and Metropolis.

Davenport, Iowa.—Scott county commissioners have approved a contract for the installation of electric transmission lines from the city limits to the county farm. The cost to the county will be $1000 and the total cost will be $3800. The contract for installing this work has been given to the Electric Construction & Machinery Co., the Peoples Light Co. approving the contract. The voltage carried will be 2200.

Wiota, Iowa.—Bonds have been voted for $10,000 electric light plant. Address city clerk.

Cameron, Mo.—A bond issue of $20,000 for water works has been voted. Address city clerk.

St. Joseph, Mo.—$500,000 in bonds has been voted for electric light improvements. Address city clerk.

Chanute, Kans.—Election will be called in the near future to vote $65,000 bonds for the extension and improvement of the electric lighting system. C. G. Wood, city clerk.

Kansas City, Kans.—The Chamber of Commerce has opened the campaign of civic organizations for the $500,000 bond issue to enlarge the municipal light plant to a capacity where it may handle all the power and light business. Unless the plant is enlarged, power must be furnished by the Kansas City Power & Light Co.

McPherson, Kans.—Central Kansas Power Co. has made plans to build a large power plant on the western end of its transmission system. McPherson is strongly considered, though Lindsborg and Ellsworth have also received consideration. The adequate water supply, the milling and large power consumers at McPherson will probably give McPherson the preference over the other two cities. The plant is estimated to cost $200,000.

Osawatomie, Kans. — Engineers Black & Veatch, 507 Interstate Bank building, Kansas City, Mo., have prepared plans for white way lighting system. Address city clerk.

Tyrone, Kans.—Election to vote bonds to purchase the Tyrone electric light plant and buy equipment for enlarging the same, carried.

Emerson, Neb.—The Emerson village council is considering the purchase of the electric light plant, now owned privately. Recently $20,000 in bonds was voted for the establishment of such a plant.

Lawrence, Neb.—An election will be held to decide the question of establishing a $6000 light system. Address town clerk.

Oshkosh, Neb.—A special election will be held to vote on the question of issuing $9750 municipal light bonds. Address G. M. Robison, village clerk.

Phillips, Neb.—Bonds have been voted for electric transmission line to be run over from the Grand Island Power Co.

West Point, Neb.—Plans are under consideration for hydroelectric plant on Elkhorn River, three miles from West Point, to supply electricity here.

SOUTH CENTRAL STATES.

Louisville, Ky.—Tentative plans are being arranged for the completion of the Frankfort & Shelbyville Electric Railway. L. C. Lashmet, New York, construction engineer, has the work in charge. Substantial subscriptions to the fund for building the road have been made by the Shelbyville Business Men's League and the Frankfort Chamber of Commerce will take similar action.

Louisville, Ky.—Louisville Gas & Electric Co. has made connections for supplying electric current to Camp Henry Knox amounting to 3750 hp. in motors. The commercial department of the company in addition to the above reports a gain of 57 customers for the week with 18 kw. of lighting and 145 hp. in motors. New business contracted for but not yet connected includes 87 customers with 41 kw. of lighting and 58 hp. in motors. Fifteen contracts were closed for wiring already built houses. There was a gain of 13.6% in electric energy output over the corresponding period a year ago.

Louisville, Ky.—William F. Krauth Electric Co., manufacturer of electrical supplies, has recently increased its capital to $20,000, to provide for general expansion.

Meridian, Miss.—E. J. Martin,

superintendent of Masonic Home, is in market for an electric light plant with a capacity of 300 lights.

Chattanooga, Tenn. — Cumberland Telephone & Telegraph Co. has recently awarded a contract for alterations and improvements in its plant to cost about $15,000. Moudy & Co., Chattanooga, are the contractors.

Montgomery, Ala.—The city commission has approved a measure granting permission to Montgomery Light & Traction Co. to extend line on Bell street to aviation depot.

Blytheville, Ark.—Missouri Southeastern Utilities Co. is arranging plans for the establishment of a new local central power plant and system for the furnishing of electric energy to various municipalities in the southeastern section of Missouri and the northwestern portion of Arkansas. It is understood that bonds to the amount of $450,000 are available to cover the cost of the project.

Conway, Ark.—$50,000 will be expended extending and improving electric light system. Address Mayor Bruce.

Humphrey, Ark.—Pine Bluff Light & Power Co. will construct a substation and transmission lines.

Little Rock, Ark.—Arkansas Light & Power Co. has been authorized by the Arkansas Corporation Commission to make many repairs and efficient changes in its plant at Marianna. Among the improvements ordered are the overhauling of the engines, repair of the building, installation of additional machinery and equipment, overhauling of switchboard, maintaining sufficient street lights, installation of new boilers and pumps and replacing all parts that fail to function properly.

Marianna, Ark.—Arkansas Light & Power Co. will improve its plant. Address general manager.

Okolona, Ark.—R. H. Andrews will install an electric plant on Antoine river, 4 miles from Okolona.

Paris, Ark.—The city commissioners will construct an electric light plant.

Pine Bluff, Ark.—Dixie Battery & Manufacturing Co. has filed notice with the Secretary of State of an increase in its capitalization from $12,000 to $25,000, to provide for general expansion.

Springdale, Ark.—Engineers will be selected immediately to make surveys and estimates for the construction of municipal sewer, water and light plant. A bond issue for $150,000 has been sold.

Afton, Okla.—Election for voting $18,000 bonds for improving the waterworks system and $10,000 for improving the electric light plant carried.

Bartlesville, Okla.—Prices and plans are being prepared for the installation of more city lights.

Okemah, Okla.—Election will be held soon to vote $23,000 in bonds for improving the water system and $50,000 for improving the electric lighting system. Earl S. Dossey, city clerk.

Pawhuska, Okla.—Election to vote $79,380 to improve sewerage system and $67,567 to improve electric power and light equipment and $238,053 to improve waterworks system will be held June 19. R. L. Carroll, commissioner.

Corsicana, Tex.—Davidson Electric Co. has bought out the Beckett Electric Co., also of Corsicana. Both concerns have been doing an extensive business here for several years.

Dallas, Tex.—Dallas Power & Light Co. has petitioned for authority to issue $1,500,000 in preferred stock and $6,000,000 in bonds for re-financing purposes. Improvements and extensions will be made. Address general manager.

WESTERN STATES.

Boise, Idaho.—Idaho Power Co. plans the erection of a transmission line from American Falls to Pocatello, a distance of 25 miles. The company is now installing a 3600-kv-a. generating unit at its hydroelectric plant at Lower Salmon.

Bend, Ore.—To provide additional power the Bend Water, Light & Power Co. has started construction of a new unit at the auxiliary plant of the C. O. I. dam.

Dallas, Ore. — Mountain States Power Co., Dallas Division, has recently been awarded a contract by the Willamette Valley Lumber Co. for furnishing additional electric energy for operation, approximating 80 hp. in motors, to be used for the proposed box manufacturing plant to be erected by the company.

Reedsport, Ore. — Arrangements have been completed by the Reedsport Power & Light Co. for the installation of a new local electric plant and distributing system.

Salem, Ore.—Two water applications involving $1,500,000 are now on file in the office of State Engineer Percy A. Cupper. These seek to take water from the Clackamas river for power purposes. Development of 11,705 hp. is sought by the Clackamas Power & Irrigation Co. which has asked to take 1000 second-feet from the river near Estacada. The proposed project which will utilize 103-foot fall of water involves construction of a ditch and flume 6.6 miles long and a dam 400 feet long at a cost of $1,250,000. The Portland Railway Light & Power Co. has filed an application for the storage of 40,400 acre feet of water from the Oak Grove Creek for development of power along the Clackamas river. Construction of storage reservoir will cost $300,000.

Oasis, Utah.—Deseret Irrigation Co. and the Melville Irrigation Co. have applied to the Public Utilities Commission for permission to supply electricity in several towns in Millard county. The companies contemplate the construction of a second power plant on the Savior river near Delta and propose to furnish electrical service in Delta, Deseret, Hinckley and Oasis.

Montrose, Colo.—Montrose has under consideration the installation of a municipal electric light plant.

Superior, Mont.—Superior Light & Water Power Co. including the ice plant, was sold to C. L. Simonson of Bonner and Glenn Hamilton of Anaconda. The plant will be remodeled and extensive improvemenuts made.

Seattle, Wash.—The city is arranging plans for extensive improvements and additions to the local municipal electric lighting system. It is understood that the council has approved appropriations approximating $36,709.86 to cover the cost of the proposed work.

Seattle, Wash.—The Board of Public Works has recently awarded a contract to the Pacific Lamp & Supply Co. for furnishing incandescent light bulbs for the ensuing year for municipal service, at a cost of about $100,000.

Spokane, Wash.—Ludwig Kemper, receiver of the Spokane Heat, Light & Power Co., has recently disposed of the property of the company valued at approximately $2,000,000, to F. C. Paine, of the Union Trust Co., and E. P. Twohy, for a consideration of $400,000.

Seattle, Wash.—Negotiations are pending between the city and Puget Sound Traction Light & Power Co. for the use by the city of the traction company's surplus power. J. D. Ross, superintendent of the municipal light & power plant, has prepared a statement for the utilities committee, showing how the surplus current can be used by the city. The traction company has offered to sell the city surplus current when it is available.

Seattle, Wash.—J. D. Ross, superintendent of the city lighting department, has filed a communication with the city council urging an appropriation of $764,360 to add a third unit to the Lake Union steam-electric plant, adding 15,000 kw. to its capacity. Request was made on the basis of the heavy demand for current.

Vancouver, Wash.—The commissioners of Clark county have appointed G. J. Poysky of Kelso engineer for a diking district in which 9000 acres of overflow land is to be reclaimed. Under plans of the project it is proposed to drain Vancouver lake, covering several thousand acres of land. Mr. Poysky supervised the reclamation of 12,000 acres of overflow land in the vicinity of Kelso. All those projects involve diking and electric pumping.

Valley, Wash.—Arrangements are being made by the farmers on the west side of the valley to erect an electric transmission line from the local system to that neighborhood.

Walla Walla, Wash.—The Washington Motor & Equipment Co. has been incorporated for $25,000 by Charles H. Perry and others.

Avalon, Cal.—Board of Trustees, Cataline Island, is considering plans for the issuance of bonds to the amount of $88,000, to provide for the acquisition, construction, etc., of an electric light system and water works. It is understood that the Board is also planning to issue bonds for $55,000, for the construction of a municipal gas works.

Fresno, Cal.—Plans are being arranged by the California Packing

Corp. for the erection of a large new power plant to be used in connection with its proposed plants. Large quantities of electrical equipment, automatic machinery, etc., will be installed in the proposed works, for all features of operation. Philip Bush, 101 California street, San Francisco, is engineer.

Glendale, Cal.—Arrangements are being made by the City Trustees for extensive improvements and additions to the municipal water system. Included in the plans is the construction of a new hydroelectric generating plant, to be used for municipal service, estimated to cost $196,000. It is proposed to issue bonds to cover the cost of the work. It is said that plans are also under consideration for the installation of a new municipal telephone system.

Los Angeles, Cal.—Clune Production Co. has had plans prepared for the construction of a new electric power plant at its works for operation. A building permit for the structure has been issued.

Los Angeles, Cal.—The City Council has completed arrangements for the installation of a new ornamental electric street-lighting system on Westmoreland place, between Seventh street and Wilshire boulevard.

Orland, Cal.—The city is considering the early installation of a new electric street-lighting system in the business section, to be of ornamental type.

Porterville, Cal.—A special election has been called by the city for July 1, to vote on the issuance of bonds for $200,000 to provide for the cost of constructing a new municipal gas plant. J. M. Berkley and Olmsted & Gillelen, associated, Hollingsworth building, Los Angeles, are engineers for the city.

San Francisco, Cal.—Pit River Power Co. is having preliminary surveys made for the location of a new dam on Pit river above Copper City in connection with the proposed hydroelectric development of the company. It is understood that the first dam will be located near Sheep Rocks, about four miles from Copper City, with the second dam located near the mouth of Totem Creek. The entire project, when completed, is estimated to represent an expenditure of over $15,000,000.

Modesto, Cal.—Approval by the governor of the Broughton irrigation bill, authorizing districts to store, manufacture, distribute and sell electrical energy, means that the Modesto and Turlock irrigation districts will jointly proceed with the construction of the $3,000,000 Don Pedro project above the present La Grange dam, so as to increase the water supply. The plans of the big project call for the construction of a power plant just below the dam.

CANADA.

Vancouver, B. C.—N. Lang Electric Fixture Co. was awarded the electrical contract in connection with Harrison Wire & Steel Co.'s new plant being erected on Industrial Island. Contract was awarded by Gardiner & Mercer.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electric Cables, Etc. (29,581).—An agency is desired by a merchant in England for the sale in New Zealand of railway material, steel rails, telegraph requirements, such as electric cables and Gordon cells; and specialties of any description. Terms, cash against documents at destination. References.

Electric Lighting Appliances (29,553).—Copper and copperware, copperplate and all kinds of copper goods, electric lighting appliances, lamps, etc., are required by a firm in Norway. Payment, cash against documents. Reference.

Electrical Supplies (29,590).—The agency and purchase of telephones, wiring devices, Edison and bayonet lamp holders, shade holders, switches, bells, plugs, brass and porcelain sockets, connecting sets, fans and other electrical supplies are desired by a man in Italy. Correspondence may be in English. References.

Electrical Equipment (29,542).—A merchant in Italy wishes to purchase or secure an agency for the sale of medical and dental equipment, electrical equipment, hospital and orthopedic supplies, rubber articles, etc. Terms, payment on receipt of goods. Correspondence may be in English. References.

Electrical Goods (29,535).—A person in this country who is soon to sail for Jugoslavia wishes to secure an agency for the sale in that republic of machinery, dry goods, textiles, food products, electrical goods, etc. References.

Electric Street Lights (29,536).—A Government engineer in Peru desires to receive catalogs from manufacturers of all kinds of structural material used in the construction of public buildings and works, such as steel work, electrical fixtures, plumbing, paints, varnishes, etc. He also requests catalogs of public and ornamental fountains for parks and buildings, ornamental electric street lights, and bronze statuary. He desires these catalogs as soon as possible, as all purchases will be made upon his recommendation.

Cables and Wires, Motors and Dynamos (29,586).—A commercial agent in Belgium wishes to purchase and later secure an agency for the sale of insulated cables and wires for electric wiring, motors and dynamos for direct and alternating current, transformers, and various electrical material. Correspondence should be in French or Flemish. References.

Electrical Machinery (29,598).—A firm in Belgium desires to purchase machinery for making jute, as follows: A steam engine, 500 hp.; oiling machines to make the jute supple; carding machines, breakers, spool machines, stretching machines, jute spinning mills for thick yarns (Nos. 5 to 10) and for thin yarns (Nos. 10 to 16); winding apparatus, rolls and cops machines, packing press, lifts for goods, heating and electric lighting installations; all apparatus for forge; transmissions, iron and wooden pulleys, landings, greasing boxes, belts, sprinklers, weighing machines, etc. Payment, cash. Correspondence may be in English. References.

PROPOSALS

Power Plant Equipment.—Bids will be received by the Public Service Commission, Los Angeles, Cal., until June 27, for machinery for the municipal power plant No. 2 in the San Francisquito Canyon, including hydraulic equipment, electric generators, transformers, auxiliary electrical equipment, etc. The estimated cost is about $500,000.

Generating Apparatus.—The Board of Public Service, Knickerbocker building, Los Angeles, Cal., will receive bids until 3 p. m., June 27, for furnishing new electric generating apparatus, transformers, hydraulic equipment, and auxiliary electrical apparatus, to be used for municipal power plant service. Specifications are on file at the offices of the Board of Public Service. James P. Vroman, secretary, No. P-16.

Electric Hoists.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for six portable electric hoists. These are to be delivered at the Washington, D. C., navy yard (Schedule 4024).

Shears.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for one direct-connected, motor-driven squaring shears for delivery at the Mare Island (Cal.) navy yard. (Schedule 4064.)

Electrical Equipment.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until June 23, under circular 1282, for copper wire and cable, condenser tubes for thimbles, copper, watthour meters, motor generator sets, starting compensators, transformers, fans, busbar supports, end bells, connectors, receptacles, switches, studs, pipe clamps, fuses, globes and sockets. For further information address the above office.

Operating Supplies.—Treasury Department, Supervising Architect's Office, Washington, D. C., will open bids at 3 p. m., June 30, for supplying to the various public buildings under the control of the Treasury Department hand, electric portable vacuum cleaners, during the fiscal year ending June 30, 1920, in accordance with the specifications, copies of which may be had at the above office in the discretion of the Supervising Architect. James A. Wetmore, acting supervising architect.

Personal

H. H. Crowell Vice-President Electric Bond & Share—Maj. Sholes Joins Edison Storage Battery—Albert Brunt Resigns

W. B. T. BELT, president of the Nebraska Telephone Co., Omaha, Neb., has been elected a member of the board of directors of the United States National Bank of Omaha.

WARD M. BURGESS has been elected president of the Nebraska Power Co., Omaha, Neb. He succeeds General Harries, who remains with the company as a director.

LIEUT.-COL. THEO. H. SCHOEPF, 15th Engineers, U. S. A., related in a very interesting manner his experiences and the work of the 15th Engineers in France at the monthly meeting of the Pittsburgh Section of American Institute of Electrical Engineers, which was held in his honor on June 7. A reception was held at the University Club, followed by a stag dinner.

H. L. GARBUTT, for the last six years of the line material section of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has been appointed manager of the Supply Division of the Westinghouse San Francisco office. In 1908 Mr. Garbutt became a part of the sales organization of the Drew Electric & Manufacturing Co. of Indianapolis, handling various types of overhead line material, with which company he remained until 1909, when he entered the Supply Department of the Chicago office of the Westinghouse company, as line material specialist. He served in this capacity until 1913, when he was made manager of the line material section, with offices at East Pittsburgh, Pa., continuing as manager until his recent promotion.

H. H. CROWELL, a vice-president of the Michigan Railway Co. and the Consumers Power Co., and who has represented the Commonwealth Power, Railway & Light Co. interests for the last eight years, has been elected a vice-president of the Electric Bond & Share Co. to fill the vacancy recently created by the death of George E. Claflin. Mr. Crowell has been identified with the electrical industry since 1889, when he entered the service of the Thomson-Houston Electric Co. Later he was New York State agent of the Thomson-Houston Motor Co., and assistant New York State manager of the Thomson-Houston Electric Co. until the organization of the General Electric Co. in 1893. He was manager of the Syracuse and Buffalo offices of the General Electric Co. until 1906, when he became chief engineer of the Commission of Gas and Electricity of New York State and later of its successor, the Public Service Commission, Second District. Since 1911 he has been with the Commonwealth Power, Railway & Light Co. properties in Michigan. Mr. Crowell is a member of the National Committee on Public Utility Conditions, which has represented the public utilities in Washington during the war.

C. I. CRIPPEN, for many years connected with the Mahoning & Shenango Railway & Light Co., has resigned to open an electrical engineering office for himself in Youngstown, Ohio.

J. L. SPENCE, who for the past six years has been general manager and chief engineer of the Stentor Electric Manufacturing Co., has resigned his position with the Klaxon-Stentor Co., which in May of last year took over the manufacture and sale of Stentor equipment. He will be identified with the Spencer Electric Co., this company having been organized to handle such equipment as Mr. Spence's extensive experience in the electrical field qualifies him to handle and develop.

MAJ. CHARLES E. SHOLES has been elected vice-president, director and general sales manager of the Edison Storage Battery Co., East Orange, N. J., succeeding Harrison G. Thompson, who has resigned to organize and conduct the Transportation Engineering Corp. of New York. Major Sholes has heretofore been identified with the construction, operation and management of Chemical Industries, and is particularly well known to manufacturers and consumers of heavy chemicals throughout the United States and Europe. He was the active member of the Creditors Committee of the Aetna Explosives, Inc., during the receivership, which is ending so creditably. During the war he served as major in Ordnance, first as chief of the chemical branch, which attended procurements of platinum, cotton linters, alcohol, acids, etc., and as army representative before the War Industries Board, and numerous other committees and boards. He was subsequently made contracting officer for the United States on the staff of Colonel La Mont, and retains his rank in the Officers' Reserve Corps. He is honorable chairman of the Society of Chemical Industry and a member of many other scientific societies.

Maj. Charles E. Sholes.

FRED W. FISCHER has severed his conection with the United States Nitrate Plant at Muscle Shoals, Ala., to become boiler-plant supervisor with the Du Pont Engineering Co.

W. G. BALPH has been appointed manager of the Safety Switch Section of the Westinghouse Krantz Factory, Brooklyn, New York. As head of this section Mr. Balph will have entire responsibility for the sale of all Krantz products, and in addition will have charge of the extension and development of this very important line to meet the needs of the country for safety switches. Prior to working as salesman in the New York office, Mr. Balph was head of the Fan Motor Division with offices at East Pittsburgh, Pa.

ALBERT BRUNT, who for the past four years has been engineer in charge of the direct-current machine design section of the Industrial Engineering Department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has resigned to return to Holland, his native country. Mr. Brunt was born in Woerden, Netherlands, November 6, 1883, and received a complete education in the schools and universities of that country. His technical training was received at the University of Delft, where he took the degree of mechanical engineer in 1905, and electrical engineer in 1906. For two years following this he was employed in design work with electrical manufacturing companies on the continent. In April, 1909, he came to America and entered the Engineering Department of the Westinghouse company at East Pittsburgh. Mr. Brunt was an active member of the American Institute of Electrical Engineers and has prepared a number of interesting articles for technical papers on direct-current motors.

Obituary.

JAMES SMITH, Flushing, L. I., N. Y., for many years connected with the Department of Electricity, Gas and Water Supply, New York, died on June 2, at his home, 316 State street, aged 63.

FREDERICK PEARCE, a well known manufacturer of telegraph, police telegraph and fire alarm apparatus, and one of the pioneers in this field, passed away recently at his home in Summit, N. J., at the age of 75 years. Mr. Pearce was born in London, England, and in early life made electrical instruments for Elliott Brothers of that city. In 1863 he accepted employment with Charles T. and J. N. Chester, pioneer telegraph instrument makers in New York, and in 1872 he engaged in business for himself. He was a member of other telegraph organizations, including the Magnetic Club of New York, International Association of Municipal Electricians, the Electrical Contractors Association, New York Electrical Society and a number of other organizations.

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Financial News

Hale & Kilburn Bonds Offered.

A preliminary offering is being made by Montgomery & Co. and Frazier & Co. of $1,500,000 first mortgage 20-year 6% sinking fund gold bonds of the Hale & Kilburn Corp. The bonds are dated June 1, 1919, and sell at 96 and interest. They are free of Pennsylvania state tax and normal Federal income tax up to and including 2% under present construction of law. The proceeds of the sale of these bonds will be used in paying off bank loans of the corporation, an existing ground rent (principal $50,000), and in supplying additional working capital to handle its largely increased business. They will be secured by a first mortgage upon the plant of the corporation, comprising about four acres of land, and the five modern manufacturing buildings erected thereon, the whole appraised by the American Appraisal Co., as of Dec. 31, 1918, at $2,246,818.90, a valuation of approximately 50% in excess of the bonds presently to be issued. The Hale & Kilburn Corp., including its predecessor companies, has been in operation for over 70 years, and is engaged in the manufacture and sale of steam and electric railway car seats and certain automobile equipment, principally enclosed types of automobile bodies and various pressed metal automobile parts and units.

Standard Gas & Electric Resumes 8 Per Cent Preferred Dividends.

At the regular meeting of the directors of Standard Gas & Electric Co., held May 27, dividends on the preferred stock were increased 8% per annum by the declaration of a dividend of 2% for the last quarter, payable upon the preferred stock June 14, to shareholders of record May 31. The company announced that this is to be its future regular dividend policy. This dividend is paid from earnings of the company for the last quarter, entirely irrespective of the very large earnings of the Shaffer interests which accrue to Standard Gas & Electric Co. from January 1 of this year. In view of the completion of the acquirement of the Shaffer properties and the further large increase to Standard Gas & Electric Co. earnings, the president appointed a committee to report at an early date upon a plan for the liquidation of the unpaid accumulated dividends on preferred stock amounting to approximately 13%.

Chicagoans Own Bulk of Commonwealth Edison.

Figures showing that the Commonwealth Edison Co. is a home owned corporation were given out by Louis A. Ferguson, vice-president. Chicagoans now hold 80% of the stock and constitute 77% of all stockholders. Of all the stockholders 55%, or 3,464, are men, 40%, or 2,340, are women, and 5%, or 288, represent miscellaneous shareholders, such as banks, estates, etc. The original financing of the old Chicago Edison Co. was done by local men. Since then there has been a wide distribution of interest in the company among small investors.

Northern Ohio Traction Offering.

An offering of $4,600,000 Northern Ohio Traction & Light Co. seven year 6% secured bonds is being made by the National City Co. at 96 and interest, to yield about 6¾%. The bonds are dated June 1, 1919, and fall due June 1, 1926. They are redeemable, as a whole or in part, at 101 and accrued interest at any time on 30 days' notice.

The Northern Ohio Traction & Light Co. conducts an electric light and power business and operates a system of electric street and interurban railways, serving an important industrial section, including Akron and Cleveland.

Oklahoma Gas Notes Sold.

Bonbright & Co. and H. M. Byllesby & Co. have sold $500,000 additional one-year 7% notes of the Oklahoma Gas & Electric Co. at 99¾.

Dallas Company Seeks to Issue Stock.

The Dallas Power & Light Co. has filed an application with the city for permission to issue $1,500,000 in preferred stock and $6,000,000 in bonds for refinancing purposes. The company now has common stock amounting to $2,000,000. Its liabilities consist of $4,000,000 in 6% unsecured notes, payable on or before April 1, 1922, and a first mortgage of $1,000,000 at 7%, payable Feb. 1, 1920. It is desired to refinance in order to take care of the first mortgage when necessary and to make needed improvements and extensions.

Nebraska Power Bonds Sold.

The Nebraska Power Co. has sold $5,600,000 first mortgage 30-year 5% bonds to the Harris Trust & Savings Bank of Chicago and Coffin & Burr of Boston. The company supplies electric light and power to the city of Omaha and vicinity, and, with its predecessor company, has been in operation for 32 years. The bonds will be secured, in the opinion of counsel, by a first and only mortgage upon all of the property of the company. They mature June 1, 1949, and are offered at 90 and interest.

Electric Railways in Receiver's Hands.

Eleven electric street railway companies in the State of New York are in the hands of receivers, according to information made public by Joseph K. Choate, chairman of the Committeee on Ways and Means to Obtain Additional Revenue of the New York State Electric Railways. Several other companies are close to bankruptcy on account of their inability to obtain the consent of the two State Public Service Commissions to increase fares to compensate for the depreciation of the nickel. The investment in electric railway companies in the state is more than $1,250,000,000.

Dividends.

Manhattan Electrical Supply Co. has declared a quarterly dividend of 1%, also a quarterly dividend of 1¾% on first preferred stock and a quarterly dividend of 1¾% on second preferred stock, all payable July 1 to stock of record June 20.

Directors of the United Light & Railways Co. have declared a quarterly dividend of 1%, also a quarterly dividend of 1½% on preferred stock, payable July 1 to stock of record June 14.

A quarterly dividend of 1¾% has been declared by the Utilities Securities Corp., payable June 27 to stockholders of record June 17.

El Paso Electric Co. has declared a quarterly dividend of $2.50, payable June 16 to stockholders of record June 4.

Board of directors of the Arkansas Valley Railway, Light & Power Co. has declared the regular quarterly dividend of 1¾% on the preferred stock of the company, payable June 16, to stockholders of record May 31.

Oklahoma Gas & Electric Co. has declared the regular quarterly dividend of 1¾% on the preferred stock of the company, payable June 16 to stockholders of record May 31.

Board of directors of the Muskogee Gas & Electric Co. has declared the regular quarterly dividend of 1¾% on the preferred stock of the company, payable June 16 to stockholders of record May 31.

Central States Electric Co. has declared a quarterly dividend of 1¾% on preferred stock, payable July 1 to stock of record June 20.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid June 3.	Bid June 10.
Adirondack Electric Power of Glens Falls, common	6	14¾	14
Adirondack Electric Power of Glens Falls, preferred	6	75½	76
American Gas & Electric of New York, common	10+extra	170	162
American Gas & Electric of New York, preferred	6	41	42
American Light & Traction of New York, common	..	269	269
American Light & Traction of New York, preferred	6	99	99
American Power & Light of New York, common	4	66	70
American Power & Light of New York, preferred	6	74	74
American Public Utilities of Grand Rapids, common	..	10	15
American Public Utilities of Grand Rapids, preferred	7	36	36
American Telephone & Telegraph of New York	..	107	106⅞
American Water Works & Elec. of New York, common	..	7½	6
American Water Works & Elec. of New York, particip	7	15	14
American Water Works & Elec. of New York, first preferred	..	60	61
Appalachian Power, common	..	6	5
Appalachian Power, preferred	7	16	16
Cities Service of New York, common	+extra	378	380
Cities Service of New York, preferred	6	79½	80
Commonwealth Edison of Chicago	8	111	111½
Comm. Power, Railway & Light of Jackson, common	..	28	29
Comm. Power, Railway & Light of Jackson, preferred	6	58	63
Federal Light & Traction of New York, common	..	10	11½
Federal Light & Traction of New York, preferred	..	46½	47
Illinois Northern Utilities of Dixon	6	70	70
Middle West Utilities of Chicago, common	2+extra	35	36½
Middle West Utilities of Chicago, preferred	6	60	62
Northern States Power of Chicago, common	..	72½	72
Northern States Power of Chicago, preferred	ex.div.7	90	90
Pacific Gas & Electric of San Francisco, common	..	57	61
Pacific Gas & Electric of San Francisco, preferred	6	88	88
Public Service of Northern Illinois, Chicago, common	7	88	92¼
Public Service of Northern Illinois, Chicago, preferred	6	92	92½
Republic Railway & Light of Youngstown, common	4	19	19
Republic Railway & Light of Youngstown, preferred	6	59	59
Standard Gas & Electric of Chicago, common	..	37	38
Standard Gas & Electric of Chicago, preferred	6	47	47
Tennessee Railway, Light & Power of Chattanooga, common	..	4½	4½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	20½	20
United Light & Railways of Grand Rapids, common	4	48	49
United Light & Railways of Grand Rapids, preferred	6	72	73
Western Power of San Francisco, common	..	22½	20
Western Union Telegraph of New York	extra	90⅛	90¼
Industries.			
Electric Storage of Philadelphia, common	4	74½	72
General Electric of Schenectady	8	168¼	167¾
Westinghouse Electric & Mfg. of Pittsburgh, common	7	57⅝	57⅞
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	57	57